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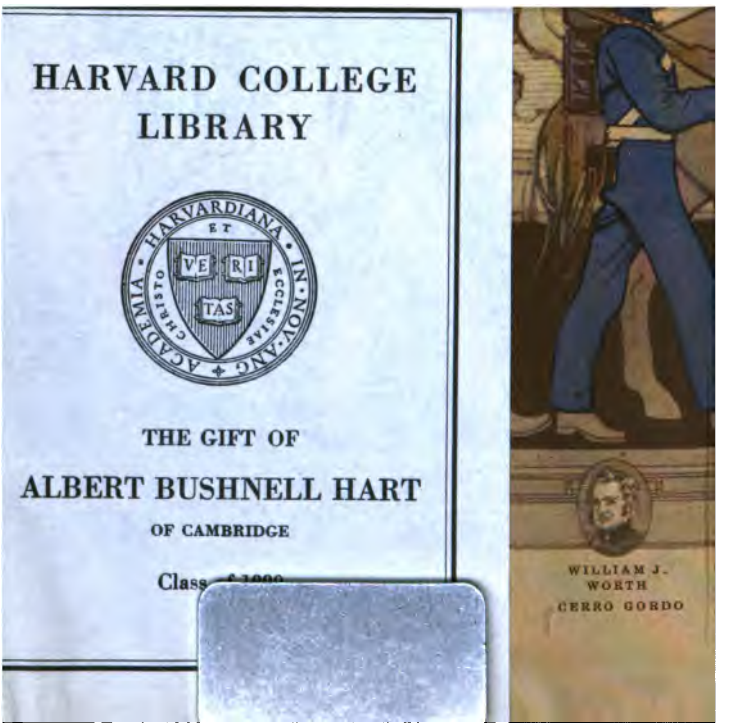

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Volume Four

RUDIMENTS OF DRILL MOBILE ARMY TROOPS

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Contents

PAGE

PREFACE 9

CHAPTER

I. GENERAL DEFINITIONS 11

A List of Military Terms Relating to All Branches and Arms of the Service and Their Meanings.

II. DUTIES, RESPONSIBILITIES, AND TRAINING OF OFFICERS AND NONCOMMISSIONED OFFICERS 16

The Regimental Commander; The Battalion Commander; The Regimental Staff Officers; Discipline; Selection of Noncommissioned Officers; Instruction and Training; Drill Regulations.

III. SCHOOL OF THE SOLDIER 26

Instruction Without Arms: Position, Rest, Eyes, Facings, Salute; Steps and Marchings: Quick Time, Mark Time, Half Step, Side Step, Back Step, Halt; March by Flank; To March to Rear; Change Step; Manual of Arms: The Rifle; The Bayonet; Bayonet Exercises; Inspection; Dismissal.

IV. INFANTRY 49

General Rules; Orders, Commands, and Signals; School of the Squad; To Form the Squad; Alignments; Intervals and Distances; To Stack and Take Arms; The School of the Company; To Form the Company; Fixed and Moving Pivots: Marching, Deployment, Assembly, etc.; Inspection; Manual of Tent Pitching; Kinds of Tents and Manner of Pitching; Manual of the Bayonet; Nomenclature, Description, and Manner of Using.

Contents

CHAPTER PAGE

V. CAVALRY 148

The Use of Cavalry; Training; The School of the Trooper; The Standard Required of Men and Horses; General Rules for Instruction in Equitation; Manual of the Pistol; Manual of the Rifle; Manual of the Saber; Mounted and Dismounted Combat; Saber Exercises; Care of Horses and Saddlery.

VI. FIELD ARTILLERY 268

Classification; Matériel of U. S.; Organization; Transportation; Posts of Officers, Noncommissioned Officers, Gun Squads, and Cannoneers; Maneuvers; Movements of the Carriages by Hand; Limbering and Unlimbering; Formations of the Battery; Firing Instruction; Rapid Fire; Fire for Adjustment, for Effect, and for Accuracy; Different Methods of Fire; Firing Data; Service Practice; The Trajectory; Observing Stations; Designation of Objectives; Observation of Fire, Terrain, and from Aircraft.

VII. ENGINEER TROOPS AND MILITARY FIELD ENGINEERING 408

Personnel; Field Fortifications; Construction of Hasty Intrenchments; Fire Trenches; Cover Trenches; Communicating Trenches; Dummy Trenches; The Digging of Trenches; Penetration and Effect of Fire; Obstacles; Demolitions; Explosives and Firing Devices; Military Bridges; General Notes on Bridge Design; Floating Bridges and Their Construction.

Contents

CHAPTER PAGE

VIII. SIGNAL CORPS AND SIGNALING 465

Training of Personnel; Organization; Instruments and Equipment for Communicating Information; Field Lines; Selection of Instruments; The American Morse, The International Morse, and General Service Codes; Signaling by Flag, Torch, Hand Lantern, Beam of Light, Heliograph and Flash Lantern; The Ardois System; General Instructions for Locating and Operating Visual Signal Stations; The Field Message.

LIST OF BOOKS AND PERIODICALS 507

APPENDIX 509

Preface

The company (troop or battery) is the basic military unit in all armies.

Armies are made up of corps, divisions, brigades, regiments, and battalions. These units are made up of companies.

The company is commanded by a captain, who is assisted by two or more lieutenants.

Very few men have been successful commanders of armies who were not first good company commanders.

The first ambition of every officer should be to become a good company commander.

This volume, consisting principally of extracts from the various drill regulations and manuals of the different branches and arms of the service, is intended to present the fundamentals of military training, primarily for the use of military students in our military schools, training camps, the organized militia and the reserve, in preparing themselves to be efficient company officers in time of war.

Efficiency is the keynote of military success, and the training of efficient company officers is the most essential step in any plan of preparedness.

Well-trained and disciplined company officers produce efficient companies, and if these basic tactical units are efficient, it must follow that the battalions, regiments, and other larger tactical units will be truly efficient.

I

General Definitions

Extracts from Drill Regulations, all branches and arms of the service:

1. **Alignment:** A straight line upon which several elements are formed, or are to be formed; or the dressing of several elements upon a straight line.

Base: The element on which a movement is regulated.

Battle sight: The position of the rear sight when the leaf is laid down.

Center: The middle point or element of a command.

Column: A formation in which the elements are placed one behind another.

Deploy: To extend the front. In general to change from column to line, or from close order to extended order.

Depth: The space from head to rear of any formation, including the leading and rear elements. The depth of a man is assumed to be 12 inches.

Disposition: The arrangement of the elements in a formation.

Distance: Space between elements in the direction of depth. Distance is measured from the back of the man in front to the breast of the man in rear. The distance between ranks is 40 inches in both line and column.

Drill: The exercises and evolutions taught on the drill ground and executed in the precise and formal manner prescribed.

Element: A file, squad, platoon, company, or larger body, forming part of a still larger body.

Evolution: A movement executed by several squadrons for the purpose of passing from one formation to another. (Cav.)

Facing distance: The difference between the front of a man in ranks, including his interval, and his depth—about 14 inches.

File: Two men, the front-rank man and the corresponding man of the rear rank. The front-rank man is the **file leader.** A file which has no rear-rank man is a **blank file.** The term **file** applies also to a single man in a single-rank formation.

File closers: Such officers and noncommissioned officers of a company as are posted in rear of the line. For convenience, all men posted in the line of file closers.

Fire direction: The tactical direction of one or more fire units with a view of bringing their fire to bear at the right place at the right time.

Fire discipline: That condition resulting from training and practice which insures an orderly and efficient working of the personnel in the delivery of fire.

Fire control: The exercise of those tactical functions connected with the concentration and distribution of fire, including the assignment and identification of targets. (C. A.)

Flank: The right or left of a command in line or in column; also the element on the right or left of the line.

Flankers: Men so posted or marched as to protect the flank of a column.

Flank attack: A movement against the enemy's flank.

Flank march: A march, whatever the forma-

tion, by which troops move parallel to the enemy's position.

Formation: Arrangement of the elements of a command. The placing of all fractions in their order in line, in column, or for battle.

Front: The space, in width, occupied by an element, either in line or in column. The front of a man is assumed to be 22 inches. Front also denotes the direction of the enemy. The front of a gun unlimbered is the direction in which the muzzle points; of a limber or of a carriage limbered, the direction in which the pole points.

Guard, advance: A body of troops marching in front of a command, to reconnoiter and to protect its march.

Guard, rear: A body of troops marching in rear of a command, to protect the rear of the command.

Guide: An officer, noncommissioned officer, or private upon whom the command or elements thereof regulates its march.

Guidon: The flag of a mounted organization.

Gunnery: The art and science of operating guns.

Head: The leading element of a column.

Interval: Space between elements of the same line. The interval between men in ranks is 4 inches and is measured from elbow to elbow. Between companies, squads, etc., it is measured from the left elbow of the left man or guide of the group on the right, to the right elbow of the right man or guide of the group on the left.

Laying: The process of pointing a gun for range and direction, so as to cause the trajectory to pass through the target. (F. A.)

Left: The left extremity or element of a body of troops.

Line: A formation in which the different elements are abreast of each other.

Line of communications: The route, either land or waterway, along which a force in the field receives its supplies and reenforcements from its base and along which prisoners, the sick and wounded are sent to the rear. In our service a commander and special troops are assigned to the defense and maintenance of the line of communications. The mission of the troops and administrative groups assigned to this line is to relieve the combatant field force as far as possible from every consideration except that of defeating the enemy.

Lines of information: Channels along which military information may be transmitted, as wire, wireless, visual, or messenger.

Maneuver: A movement executed by a company or larger unit for the purpose of changing from one formation to another.

Order, close: The formation in which the units, in double rank, are arranged in line or in column with normal intervals and distances.

Order, extended: The formation in which the units are separated by intervals greater than in close order.

Pace: Thirty inches; the length of the full step in quick time.

Patrol: One or more men sent out from a command to gain information of the country or of the enemy, or to prevent the enemy from gaining information.

Ploy: To diminish front.

Point of rest: The point at which a formation begins. Specifically, the point toward which units are aligned in successive movements.

Rank: A line of men placed side by side.

General Definitions

Reconnaissance: The military term used to designate the work of troops or individuals when gathering information in the field.

Right: The right extremity or element of a body of troops.

Salvo: A single discharge from each of the guns of a battery or other unit fired in regular order from one flank to the other, with intervals of about two seconds. (F. A.) The simultaneous firing of a single load from each gun or mortar of a battery or from each mortar of a pit. (C. A.)

Scouts: Men detailed to precede a command on the march, and when forming for battle, to gather and report information concerning the enemy and the nature of the ground.

Tactics: The art of landing troops in the presence of the enemy; i. e., applying on the battle field the movements learned at drill.

Tail: The rear element of a column, in whatever direction the column is facing.

Turning movement: An extended movement around the enemy's flank for the purpose of threatening or attacking his flank or rear.

Volley: The simultaneous firing of a single round from each rifle or pistol by a squad, platoon, or larger body of troops. The rapid discharge of a certain indicated number of rounds, by each gun of a battery or unit, each gun firing without regard to the others. (F. A.)

Wing: The portion of a command between the center and the flank; the squadron is the smallest body which is divided into wings.

II

Duties, Responsibilities, and Training of Officers and Noncommissioned Officers

2. In our service the regiment is the normal administrative unit. The exceptions to this rule are the mounted battalions of the Engineer Corps, the battalions and aero squadrons of the Signal Corps, and the coast defense commands of the Coast Artillery Corps. The regiment is composed of two or more battalions or squadrons,[1] which in turn are composed of two or more companies, troops or batteries.

The regiment is the normal command of a colonel; in his absence the command devolves upon the lieutenant colonel or the next senior officer on duty with it.

3. The regimental commander is responsible for the instruction, tactical efficiency, and preparedness for war service of his regiment. He should encourage among his officers harmonious relations and a friendly spirit of emulation and cooperation in the performance of duty, and he should vigilantly preserve for each the initiative pertaining to his sphere of responsibility. His timely interference to prevent disputes, his advice to the inexperienced, and immediate censure of any conduct liable to produce dissension in the com-

[1] Hereafter the term "battalion" should be interpreted to include both battalion and squadron, and the term "company" to include company, troop, and battery.

mand or to reflect discredit upon it are of great importance in securing and maintaining its efficiency. In such efforts they should receive the loyal support of their subordinates. Unity of purpose and convergence of effort can be secured only through the impulse of the will of the chief transmitted through his agents. To this end the regimental commander should personally direct the instruction of his field officers and captains in all that pertains to their rôle and duties in peace and war, and should assure himself that all his officers maintain themselves in fit physical condition for active service.

4. The lieutenant colonel assists the colonel in the execution of his duties in such manner as the colonel may direct, supervises the execution of his orders, and in his absence assumes his duties. He may be appropriately assigned to the command of any part of a regiment larger than a battalion, or to the command of a battalion in the absence of its major.

5. The battalion in a regiment is not an administrative unit and has no separate records; it is purely a tactical unit conveniently organized for instruction or maneuver, and particularly for combat, either as an integral part of the regiment to which it belongs or separated from it. Normally it is commanded by a major, regularly assigned in orders.

6. The battalion commander is responsible for the instruction, tactical efficiency, and preparedness for war service of his battalion. He should see that the results desired by the colonel are attained, leaving to the captains a large initiative in the choice of means.

7. The regimental staff officers are appointed from the captains of the regiment, and consist of the adjutant and supply officer. The adjutant under the direction of the regimental commander

has charge of the regimental papers and records, and through him the regimental commander communicates with the officers and men of his command. He commands and is responsible for the efficiency and discipline of the headquarters company. The adjutant should be courteous to and on friendly terms with the officers of the command and should avoid all discussions of the orders or military conduct of his superiors. He should inform himself upon all points of military usage and etiquette, and should endeavor at all times to exert the influence belonging to his position in sustaining the reputation, discipline, and harmony of the command. The supply officer commands the supply company and is responsible for its efficiency and discipline. He is accountable for all the property and supplies of the regiment, and should make timely requisition for all supplies required, and is responsible under the regimental commander for the sufficiency of the same. He makes such returns and reports concerning the property and supplies as are required by the War Department.

8. The company is the normal command of a captain. The commanding officer of a company is responsible for the instruction, tactical efficiency, and preparation for war service of his company; for its appearance and discipline; for the care and preservation of its equipment; for its subsistence, pay, clothing, accounts, reports, and returns.

Captains of organizations should have great latitude as to the means employed to get results. The end to be attained having been indicated or ordered, superior officers should interfere in the instruction or handling of the company only when necessary to insure diligence, to rectify mistakes, or to prevent omissions. They should personally direct the instruction and training of their lieutenants and noncommissioned officers, cooks, me-

chanics, horseshoers, saddlers, wagoners, buglers, and men detailed for special positions in combat, such as scouts, range-finding details, observers, signalmen, telephone operators and others of special importance. The company being the basic unit of the military system and the essential school through which all officers and soldiers must obtain most important training, the captain's duties are of the greatest importance and require his constant and undivided attention. He should know the antecedents, character, ability and special fitness of every officer, noncommissioned officer and others mentioned above.

9. Captains should require their lieutenants to assist in the performance of all routine administrative duties and should hold each responsible for some definite portion of the same. They should be held responsible for the tactical efficiency and condition of their platoons. They should have an intimate knowledge of the characteristics of each man and animal in their platoons; of the condition of their arms and equipment, guns, etc. In time of peace, however, the duties should be changed from time to time in order that each lieutenant should receive complete instruction in all the different duties of a subaltern in the organization and be prepared to assume command of the company if necessary.

10. Discipline is the first requisite for success in any military organization or command, and, while maintaining discipline and the thorough and prompt performance of military duty, all officers, in dealing with enlisted men, should bear in mind the absolute necessity of so treating them as to preserve their self-respect. Company officers should keep in close touch with the men of their organizations, and should strive to build up such relations of confidence and sympathy as will insure

the free approach of their men for counsel and assistance.

11. One of the most important duties of a company commander is the selection of his noncommissioned officers. In selecting privates for promotion many things must be considered, such as character, past service and conduct, training, ability, probable efficiency, age, personality, etc. While the essential qualities are many in order that a man may properly perform the diverse and important duties of a noncommissioned officer, there is no fixed standard, and indeed a man would have to be a perfect soldier to meet all the desirable qualifications. Naturally the personality of the captain enters largely into the selection, and some give greater weight to one qualification than do others. Generally the characteristics of a company commander are reflected very truly by his noncommissioned officers, and his own peculiarities and efficiency are indicated by the quality of these men. The one great requisite is character, and the company commander should constantly bear in mind in making his selections that these men may some day become officers, and that in case of a great conflict that they will most likely be called upon to fill an officer's position either at the front or at home in the training of troops.

It is not necessary that the candidate for promotion to the grade of noncommissioned officer be of exceptional education. He should, however, have a good memory and be able to read and write and have an elementary knowledge of arithmetic. With these he can, with sufficient ambition and training, advance himself in due time. He should be thoroughly disciplined and drilled in his duties as a private of his arm of the service for war. He should be familiar with his equipment, its care and usage, with his weapon or weapons as the case may be, and should be expert in their use. If a

mounted soldier, he should be a good horseman and familiar with the care and management of horses. If in the field artillery, he should be a first-class gunner and thoroughly familiar with all the duties of the cannoneer.

Instruction and Training

12. **General:** The instruction of his command in all that pertains to its duties in war is, next to effective leadership, the most important duty devolving upon a commander. All other service functions must be subordinate to it.

Officers and noncommissioned officers are charged with a responsibility commensurate with their grade or rank for the performance of this most important duty. They must devote to it their best efforts and their unremitting care and attention.

13. The drill regulations of the several arms prescribe their particular methods of training in the ordinary duties pertaining to their special functions in war. The personnel must be so thoroughly drilled that in the excitement of action the duties will be performed as a matter of second nature. The drill regulations serve as a guide to the best way of dealing with the usual problems which arise. But every problem which arises in service has its own best solution, and this solution must be evolved by the officer on the spot. Instruction in peace must therefore be conducted with a view, first, of drilling the personnel thoroughly in their habitual duties; second, of affording officers and men practice and experience in dealing with situations and difficulties apt to arise in campaign.

It is the duty of all commanders to see that instruction is conducted in accordance with the principles and that the means employed are in conformity with the spirit of the drill regula-

tions, but in the application of the principles to the solution of practical problems the methods prescribed are to be taken as guides only. Great latitude should be allowed in adapting these methods to the peculiar conditions of different cases, and subordinates should be encouraged in every possible way to exercise their skill and ingenuity in solving the problems which present themselves in service.

Instruction must not be limited to mere professional training, but must be extended to include the moral education and physical development essential to success in war. It must not only develop the memory and intelligence of the soldier, but must awaken in him a sense of pride in his profession, a confidence in his ability to overcome the enemy, a feeling of devotion to his leaders, and that pride in his country's institutions and past achievements which increases patriotism.

The instruction in the regiment must be conducted during the entire year so as to fulfill the following conditions:

(a) The regiment must at all times be prepared to take the field.

(b) Recruits must be brought as rapidly as is consistent with thorough training to a state of preparation for field service.

(c) The system must be such as to bring the regiment to a proper state of preparation for target practice and for participation in the annual maneuvers or field exercises.

The course of instruction should comprise:

(a) The instruction of officers, noncommissioned officers, and special grades.

(b) The instruction of the soldier individually and in the various units.

To impart instruction efficiently officers and noncommissioned officers must be able to execute, with the greatest degree of skill, all that they are

called upon to teach others, and must understand and use to practical advantage the methods of instruction recognized as the best.

To be able to lead their units without hesitation and with success they should be practiced in assuming situations in which they will find themselves in war and in indicating the most rapid and simple measures to meet the conditions.

Training and Instruction of Officers

14. The value of a military command depends largely upon the training and knowledge of its officers.

Nothing should be neglected which will tend to increase their professional knowledge or to elevate their moral and intellectual position.

Responsibility for the training of officers rests upon regimental and battalion commanders. Apart from the instruction received from their superior officers, all officers should labor ceaselessly to perfect their military training, to keep themselves abreast of all progress in their arm, and to study the conditions and necessities of modern war.

In order to fulfill its mission in war, an organization must be able to make the most effective use of its weapons, to march rapidly and in good order, and to make the best use of the available terrain in maneuver and action. The officers then must first be thoroughly trained in the use of their particular arm and must be fully alive to its powers and limitations in action. They must be thoroughly trained in marching, camping, sanitation, topography, reconnaissance and communication service, fire discipline, conduct of fire and fire direction, observation and correction of fire, intrenchments and use of cover, trench warfare, use of machine guns, and when mounted, a thorough knowledge of horses under the saddle and in draft.

This thorough knowledge of their own arm is not sufficient; officers must understand the functions of the other arms and the tactical principles which guide those arms in action.

Officers must be of strong character and their training should develop coolness, good judgment and leadership. They must be trained to think quickly and logically and to assume responsibilities unhesitatingly.

An officer's military knowledge must be a part of himself and its application under all conditions must be a matter of second nature.

Map and terrain exercises should be devised to enable the officers to make practical application of what they have learned. These exercises should be simple and entirely practical and suited to the grade of the officer under instruction. The aim being to train the officer to grasp quickly situations in war; to form decisions rapidly and correctly, and to formulate clear and precise orders and reports.

Training and Instruction of Noncommissioned Officers

15. Noncommissioned officers must be able to instruct in the school of the soldier, the platoon, and, in the higher grades, the school of the company. They must have a thorough knowledge of the weapons of the company and their usages and must be able to assist their officers in the details of service required of the organization, and to replace them in case of necessity. In each grade they should be instructed and practiced in the duties of the next higher grade.

Their theoretical instruction should embrace such of the regulations as pertain to their duties, including the drill regulations of the arm, guard duty, small-arms firing manual, field service

regulations, first aid and personal hygiene, care of clothing and equipment, interior economy of the company, marching, camping, topography and sketching, signaling, rifle trenches and use of cover, swimming and physical drill; if mounted, equitation, care and management of horses, care of harness and saddlery; if in the field artillery, the cannoneer, care of matériel, and the driver, use of telephones.

Their practical instruction should embrace all that is necessary to prepare them for their duties as instructors, for their functions in the schools of the platoon and company, and for any special missions or duties that may be assigned them.

III

School of the Soldier

Extracts from Drill Regulations, all branches and arms of the service:

16. Thorough training of the individual soldier is the basis of military efficiency. In the instruction of the soldier precision and attention to detail are vitally essential. This is particularly true of recruit instruction, the formative period of the soldier, and during this period he must acquire the habit of implicit obedience to orders, and of accurate performance of his individual duties, which is the indispensable requisite for efficiency in combined training and action. The spirit of implicit obedience must permeate the whole military force from private to commander.

The undisciplined soldier is a handicap to his organization in both peace and war. During war he is both unreliable and dangerous, and may become a menace to his country. Military history supplies many examples of losses and disaster due to the lack of discipline on the part of both subordinates and commanders.

17. This school has for its object the instruction of the individual recruit on foot and afterward that of the squad.

From the beginning the instructor should insist upon a smart appearance of the recruits, and should exact that their clothing be clean and neatly adjusted.

18. The preliminary instruction of recruits in the position of the soldier, rests, facings, steps,

and marchings is the same in all branches and arms of the service. The manual of arms is the same for all troops armed with the rifle. The manual of the pistol is the same for all troops armed with the pistol.

19. The instructor explains briefly each movement, first executing it himself if practicable. He requires the recruits to take the proper positions unassisted and does not touch them for the purpose of correcting them, except when they are unable to correct themselves. He avoids keeping them too long at the same movement, although each should be understood before passing to another. He exacts by degrees the desired precision and uniformity.

20. Short and frequent drills are preferable to long ones, which exhaust the attention of both instructor and recruit.

21. Generally, sergeants and corporals are the instructors under the supervision of an officer; but the captain occasionally requires the lieutenants to act as instructors.

22. The instructor should always maintain a military bearing, and by a quiet, firm demeanor set a proper example to the men. Mistakes should be corrected gradually, without nagging and without shouting.

23. As the recruits become somewhat proficient in the school of the soldier they should be required in turn to drill the squad in the presence of the instructor and to correct any errors noted. This will increase their interest and hasten their instruction.

24. In the instruction of the recruit, frequent short rests should be given, in order that the men may not be unduly fatigued.

The instructor should take advantage of these rests to instruct the recruits in the customs and

courtesies of the service, the duties of orderlies, the proper manner of receiving messages from and delivering them to officers, etc., so that when the recruit is finally reported for duty he will not only know his prescribed drill thoroughly, but will know how to conduct himself out of ranks as a trained soldier.

25. The instruction of the recruit should also include the duties of sentinels, the care of equipment, packing of field equipment, tent pitching, rifle and pistol practice, Articles of War, Army Regulations, outlines of first aid, personal hygiene, sanitation, signaling, etc.

26. When, for purposes of instruction, any movement is divided into motions, or executed in detail, the command of execution determines the prompt execution of the first motion, and the commands: **TWO, THREE,** etc., that of the other motions.

To execute the movements in detail, the instructor first commands: **By the numbers;** all movements divided into motions are then executed as above explained, until the command: **Without the numbers,** or until he commands movements other than those in the manual of arms.

27. After the movements have been properly executed in the order laid down, the instructor no longer confines himself to that order.

28. When the execution of a movement is improperly begun and the instructor wishes to begin it anew for the purpose of correcting it, he commands: **As you were;** at which the movement ceases and the former position is resumed.

29. To teach the recruits to assemble, the instructor requires them to place the palm of the left hand upon the hip, below the belt when worn; he then places them on the same line, so that the right arm of each man rests lightly against the

left elbow of the man next on his right, and then directs the left hands to be replaced by the side.

30. When the recruits have learned how to take their places, the instructor commands: **FALL IN.**

They assemble rapidly, as above prescribed, at attention, each man dropping the left hand as soon as the man next on his left has his interval.

Instruction Without Arms

31. For preliminary instruction a number of recruits, usually not exceeding three or four, are formed as a squad in single rank.

POSITION OF THE SOLDIER, OR ATTENTION

32. Heels on the same line and as near each other as the conformation of the man permits.

Feet turned out equally and forming an angle of about 45°.

Knees straight without stiffness.

Hips level and drawn back slightly; body erect and resting equally on hips; chest lifted and arched; shoulders square and falling equally.

Arms and hands hanging naturally, thumb along the seam of the trousers.

Head erect and squarely to the front, chin drawn in so that the axis of the head and neck is vertical; eyes straight to the front.

Weight of the body resting equally upon the heels and balls of the feet.

THE REST

33. Being at a halt, the commands are: **FALL OUT; REST; AT EASE;** and, 1. **Parade,** 2. **REST.**

At the command of **fall out,** the men may leave the ranks, but are required to remain in the imme-

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diate vicinity. They resume their former places, at attention, at the command **fall in.**

At the command **rest** each man keeps one foot in place, but is not required to preserve silence or immobility.

At the command **at ease** each man keeps one foot in place and is required to preserve silence but not immobility.

34. 1. **Parade,** 2. **REST.** Carry the right foot 6 inches straight to the rear; left knee lightly bent; clasp the hands, without constraint, in front of the center of the body, fingers joined, left hand uppermost, left thumb clasped by the thumb and forefinger of the right hand; preserve silence and steadiness of position.

35. To resume the attention: 1. **Squad,** 2. **ATTENTION.**

The men take the position of the soldier.

EYES RIGHT OR LEFT

36. 1. **Eyes,** 2. **RIGHT (LEFT),** 3. **FRONT.**

At the command **right,** turn the head to the right oblique, eyes fixed on the line of eyes of the men in, or supposed to be in, the same rank. At the command **front,** turn the head and eyes to the front.

FACINGS

37. To the flank: 1. **Right (left),** 2. **FACE.**

Raise slightly the left heel and right toe; face to the right, turning on the right heel, assisted by a slight pressure on the ball of the left foot; place the left foot by the side of the right. Left face is executed on the left heel in the corresponding manner.

Right (left) half face is executed similarly, facing 45°.

"To face in marching" and advance, turn on the

ball of either foot and step off with the other foot in the new line of direction; to face in marching without gaining ground in the new direction, turn on the ball of either foot and mark time.

38. To the rear: 1. **About,** 2. **FACE.**

Carry the toe of the right foot about a half foot-length to the rear and slightly to the left of the left heel without changing the position of the left foot; face to the rear, turning to the right on the left heel and right toe; place the right heel by the side of the left.

SALUTE WITH THE HAND

39. 1. **Hand,** 2. **SALUTE.**

Raise the right hand smartly till the tip of the forefinger touches the lower part of the headdress or forehead above the right eye, thumb and fingers extended and joined, palm to the left, forearm inclined at about 45°; hand and wrist straight; at the same time look toward the person saluted. **(TWO)** Drop the arm smartly by the side.

For rules governing salutes, see "Honors and Salutes," pars. 758-765, Infantry Drill Regulations, 1911.

STEPS AND MARCHINGS

40. All steps and marchings executed from a halt, except right step, begin with the left foot.

41. The length of the full step in quick time is 30 inches, measured from heel to heel, and the cadence is at the rate of 120 steps per minute.

The length of the full step in double time is 36 inches; the cadence is at the rate of 180 steps per minute.

The instructor, when necessary, indicates the cadence of the step by calling **one, two, three,**

four, or left, right, the instant the left and right foot, respectively, should be planted.

42. All steps and marchings and movements involving march are executed in **quick time** unless the squad be marching in **double time,** or **double time** be added to the command; in the latter case **double time** is added to the preparatory command. Example: 1. **Squad right, double time,** 2. **MARCH** (School of the Squad).

QUICK TIME

43. Being at a halt, to march forward in quick time: 1. **Forward,** 2. **MARCH.**

At the command **forward,** shift the weight of the body to the right leg, left knee straight.

At the command **march,** move the left foot smartly straight forward 30 inches from the right, sole near the ground, and plant it without shock; next, in like manner, advance the right foot and plant it as above; continue the march. The arms swing naturally.

44. Being at a halt, or in march in quick time, to march in double time: 1. **Double time,** 2. **MARCH.**

If at a halt, at the first command shift the weight of the body to the right leg. At the command **march,** raise the forearms, fingers closed, to a horizontal position along the waist line; take up an easy run with the step and cadence of double time, allowing a natural swinging motion to the arms.

If marching in quick time, at the command **march,** given as either foot strikes the ground, take one step in quick time, and then step off in double time.

45. To resume the quick time: 1. **Quick time,** 2. **MARCH.**

At the command **march,** given as either foot strikes the ground, advance and plant the other foot in double time; resume the quick time, dropping the hands by the sides.

TO MARK TIME

46. Being in march: 1. **Mark time,** 2. **MARCH.**

At the command **march,** given as either foot strikes the ground, advance and plant the other foot; bring up the foot in rear and continue the cadence by alternately raising each foot about 2 inches and planting it on line with the other.

Being at a halt, at the command **march,** raise and plant the feet as described above.

THE HALF STEP

47. 1. **Half step,** 2. **MARCH.**

Take steps of 15 inches in quick time, 18 inches in double time.

48. Forward, half step, halt, and **mark time** may be executed one from the other in quick or double time.

To resume the full step from half step or mark time: 1. **Forward,** 2. **MARCH.**

SIDE STEP

49. Being at a halt or mark time: 1. **Right (left) step,** 2. **MARCH.**

Carry and plant the right foot 15 inches to the right; bring the left foot beside it and continue the movement in the cadence of quick time.

The side step is used for short distances only and is not executed in double time.

If at order arms, the side step is executed **at trail** without command.

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BACK STEP

50. Being at a halt or mark time: 1. **Backward,** 2. **MARCH.**

Take steps of 15 inches straight to the rear.

The back step is used for short distances only and is not executed in double time.

If at order arms, the back step is executed at **trail** without command.

TO HALT

51. To arrest the march in quick or double time: **1. Squad,** 2. **HALT.**

At the command **halt,** given as either foot strikes the ground, plant the other foot as in marching; raise and place the first foot by the side of the other. If in double time, drop the hands by the sides.

TO MARCH BY THE FLANK

52. Being in march: 1. **By the right (left) flank,** 2. **MARCH.**

At the command **march,** given as the right foot strikes the ground, advance and plant the left foot, then face to the right in marching and step off in the new direction with the right foot.

TO MARCH TO THE REAR

53. Being in march: **To the rear,** 2. **MARCH.**

At the command **march,** given as the right foot strikes the ground, advance and plant the left foot; turn to the right about on the balls of both feet and immediately step off with the left foot.

If marching in double time, turn to the right about, taking four steps in place, keeping the cadence, and then step off with the left foot.

CHANGE STEP

54. Being in march: 1. **Change step,** 2. **MARCH.**

At the command **march,** given as the right foot strikes the ground, advance and plant the left foot; plant the toe of the right foot near the heel of the left and step off with the left foot.

The change on the right foot is similarly executed, the command **march** being given as the left foot strikes the ground.

MANUAL OF ARMS

55. As soon as practicable the recruit is taught the use, nomenclature (Pl. 1), and care of his rifle; when fair progress has been made in the instruction without arms, he is taught the manual of arms; instruction without arms and that with arms alternate.

56. The following rules govern the carrying of the piece:

First. The piece is not carried with cartridges in either the chamber or the magazine except when specifically ordered. When so loaded, or supposed to be loaded, it is habitually carried locked; that is, with the **safety lock** turned to the "safe." At all other times it is carried unlocked, with the trigger pulled.

Second. Whenever troops are formed under arms, pieces are immediately inspected at the commands: 1. **Inspection,** 2. **ARMS;** 3. **Order (Right shoulder, port),** 4. **ARMS.**

A similar inspection is made immediately before dismissal.

If cartridges are found in the chamber or magazine they are removed and placed in the belt.

Third. The cut-off is kept turned "off" except when cartridges are actually used.

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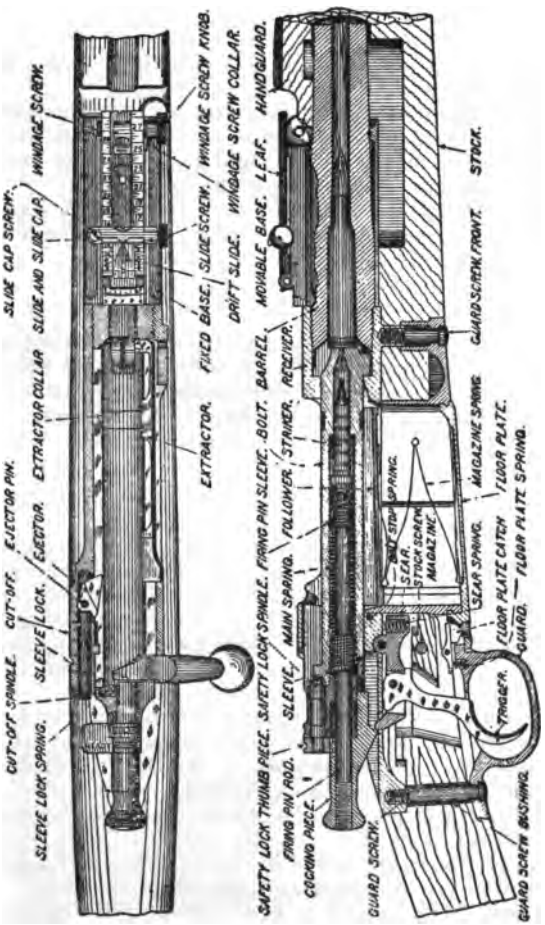

Plate I (par. 55).

Fourth. The bayonet is not fixed except in bayonet exercise, on guard, or for combat.

Fifth. **Fall in** is executed with the piece at the order arms. **Fall out, rest,** and **at ease** are executed as without arms. On resuming **attention** the position of order arms is taken.

Sixth. If at the order, unless otherwise prescribed, the piece is brought to the right shoulder at the command **march,** the three motions corresponding with the first three steps. Movements may be executed at the trail by prefacing the preparatory command with the words **at trail**; as, 1. **At trail, forward,** 2. **MARCH**; the trail is taken at the command **march.**

When the facings, alignments, open and close ranks, taking interval or distance, and assemblings are executed from the order, raise the piece to the trail while in motion and resume the order on halting.

Seventh. The piece is brought to the order on halting. The execution of the order begins when the halt is completed.

Eighth. A disengaged hand in double time is held as when without arms.

57. The following rules govern the execution of the manual of arms:

First. In all positions of the left hand at the balance (center of gravity, bayonet unfixed) the thumb clasps the piece; the sling is included in the grasp of the hand.

Second. In all positions of the piece "diagonally across the body" the position of the piece, left arm and hand are the same as in port arms.

Third. In resuming the order from any position in the manual, the motion next to the last concludes with the butt of the piece about 3 inches from the ground, barrel to the rear, the left hand above and near the right, steadying the piece, fingers extended and joined, forearm and wrist

straight and inclining downward, all fingers of the right hand grasping the piece. To complete the order, lower the piece gently to the ground with the right hand, drop the left quickly by the side, and take the position of order arms.

Allowing the piece to drop through the right hand to the ground, or other similar abuse of the

Plate 2 (par. 57).

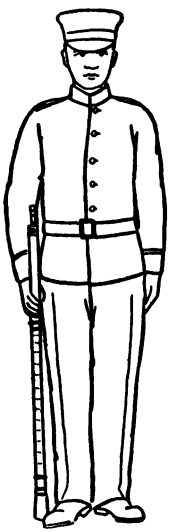

Plate 3 (par. 58).

Plate 4 (par. 58).

rifle to produce effect in executing the manual, is prohibited.

Fourth. The cadence of the motions is that of quick time; the recruits are first required to give their whole attention to the details of the motions, the cadence being gradually acquired, as they become accustomed to handling their pieces. The

instructor may require them to count aloud in cadence with the motions.

Fifth. The manual is taught at a halt and the movements are, for the purpose of instruction, divided into motions and executed in detail; in this case the command of **execution** determines the prompt execution of the first motion, and the commands, **two, three, four,** that of the other motions.

To execute the movements in detail, the instructor first cautions: **By the numbers;** all movements divided into motions are then executed as above explained until he cautions: **Without the numbers;** or commands movements other than those in the manual of arms.

Sixth. Whenever circumstances require, the regular positions of the manual of arms and the firings may be ordered without regard to the previous position of the piece.

Under exceptional conditions of weather or fatigue the rifle may be carried in any manner directed.

58. Position of order arms standing: The butt rests evenly on the ground, barrel to the rear, toe of the butt on a line with toe of, and touching, the right shoe, arms and hands hanging naturally, right hand holding the piece between the thumb and fingers.

59. Being at order arms: 1. **Present,** 2. **ARMS.** With the right hand carry the piece in front of the center of the body, barrel to the rear and vertical, grasp it with the left hand at the balance, forearm horizontal and resting against the body. **(TWO)** Grasp the small of the stock with the right hand.

60. Being at order arms: 1. **Port,** 2. **ARMS.** With the right hand raise and throw the piece diagonally across the body, grasp it smartly with

both hands; the right, palm down, at the small of the stock; the left, palm up, at the balance; barrel up, sloping to the left and crossing opposite the junction of the neck with the left shoulder; right forearm horizontal; left forearm

Plate 5 (par. 59).

Plate 6 (par. 60).

resting against the body; the piece in a vertical plane parallel to the front.

61. Being at present arms: 1. **Port, 2. ARMS.** Carry the piece diagonally across the body and take the position of port arms.

62. Being at port arms: 1. **Present, 2. ARMS.** Carry the piece to a vertical position in front of

the center of the body and take the position of present arms.

63. Being at present or port arms: 1. **Order,** 2. **ARMS.**

Let go with the right hand; lower and carry the piece to the right with the left hand; regrasp

Plate 7 (par. 64).

Plate 8 (par. 64).

it with the right hand just above the lower hand, let go with the left hand, and take the next to the last position in coming to the order. **(TWO)** Complete the order.

64. Being at order arms: 1. **Right shoulder,** 2. **ARMS.**

With the right hand raise and throw the piece diagonally across the body; carry the right hand quickly to the butt, embracing it, the heel between the first two fingers. **(TWO)** Without changing the grasp of the right hand, place the piece on the right shoulder, barrel up and inclined at an angle of about 45° from the horizontal, trigger guard in the hollow of the shoulder, right elbow near the side, the piece in a vertical plane perpendicular to the front; carry the left hand, thumb and fingers extended and joined, to the small of the stock, tip of the forefinger touching the cocking piece, wrist straight and elbow down. **(THREE)** Drop the left hand by the side.

65. Being at right shoulder arms: 1. **Order,** 2. **ARMS.**

Press the butt down quickly and throw the piece diagonally across the body, the right hand retaining the grasp of the butt. **(TWO), (THREE)** Execute order arms as described from port arms.

66. Being at port arms: 1. **Right shoulder,** 2. **ARMS.**

Change the right hand to the butt. **(TWO), (THREE)** As in right shoulder arms from order arms.

67. Being at right shoulder arms: 1. **Port,** 2. **ARMS.**

Press the butt down quickly and throw the piece diagonally across the body, the right hand retaining its grasp of the butt. **(TWO)** Change the right hand to the small of the stock.

68. Being at right shoulder arms: 1. **Present,** 2. **ARMS.**

Execute port arms. **(THREE)** Execute present arms.

69. Being at present arms: 1. **Right shoulder,** 2. **ARMS.**

Execute port arms. **(TWO), (THREE), (FOUR)** Execute right shoulder arms as from port arms.

70. Being at port arms: 1. **Left shoulder, 2. ARMS.**

Carry the piece with the right hand and place it on the left shoulder, barrel up, trigger guard

Plate 9 (par. 70).

Plate 10 (par. 71).

Plate 11 (par. 72).

in the hollow of the shoulder; at the same time grasp the butt with the left hand, heel between first and second fingers, thumb and fingers closed on the stock. **(TWO)** Drop the right hand by the side.

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Being at left shoulder arms: 1. **Port,** 2. **ARMS.**

Grasp the piece with the right hand at the small of the stock. **(TWO)** Carry the piece to the right with the right hand, regrasp it with the left, and take the position of port arms.

Left shoulder arms may be ordered directly from the order, right shoulder or present, or the reverse. At the command **arms** execute **port arms** and continue in cadence to the position ordered.

71. Being at order arms. 1. **Parade,** 2. **REST.**

Carry the right foot 6 inches straight to the rear, left knee slightly bent; carry the muzzle in front of the center of the body, barrel to the left; grasp the piece with the left hand just below the stacking swivel, and with the right hand below and against the left.

Being at parade rest: 1. **Squad,** 2. **ATTENTION.**

Resume the order, the left hand quitting the piece opposite the right hip.

72. Being at order arms: 1. **Trail,** 2. **ARMS.**

Raise the piece, right arm slightly bent, and incline the muzzle forward so that the barrel makes an angle of about 30 degrees with the vertical.

When it can be done without danger or inconvenience to others, the piece may be grasped at the balance and the muzzle lowered until the piece is horizontal; a similar position in the left hand may be used.

73. Being at trail arms: 1. **Order,** 2. **ARMS.**

Lower the piece with the right hand and resume the order.

RIFLE SALUTE

74. Being at right shoulder arms: 1. **Rifle,** 2. **SALUTE.**

Carry the left hand smartly to the small of the stock, forearm horizontal, palm of hand down, thumb and fingers extended and joined, forefinger touching end of cocking piece; look toward the

Plate 12 (par. 74).

Plate 13 (par. 75).

person saluted. **(TWO)** Drop left hand by the side; turn head and eyes to the front.

75. Being at order or trail arms: 1. **Rifle,** 2. **SALUTE.**

Carry the left hand smartly to the right side, palm of the hand down, thumb and fingers extended and joined, forefinger against piece near the muzzle; look toward the person saluted.

(TWO) Drop the left hand by the side; turn the head and eyes to the front.

For rules governing salutes, see "Honors and Salutes" (pars. 758-765, Infantry Drill Regulations, 1911).

THE BAYONET

76. Being at order arms: 1. **Fix,** 2. **BAYONET.**

If the bayonet scabbard is carried on the belt: Execute parade rest; grasp the bayonet with the right hand, back of hand toward the body; draw the bayonet from the scabbard and fix it on the barrel, glancing at the muzzle; resume the order.

If the bayonet is carried on the haversack: Draw the bayonet with the left hand and fix it in the most convenient manner.

77. Being at order arms: 1. **Unfix,** 2. **BAYONET.**

If the bayonet scabbard is carried on the belt: Execute parade rest; grasp the handle of the bayonet firmly with the right hand, pressing the spring with the forefinger of the right hand; raise the bayonet until the handle is about 12 inches above the muzzle of the piece; drop the point to the left, back of the hand toward the body, and, glancing at the scabbard, return the bayonet, the blade passing between the left arm and the body; regrasp the piece with the right hand and resume the order.

If the bayonet scabbard is carried on the haversack: Take the bayonet from the rifle with the left hand and return it to the scabbard in the most convenient manner.

If marching or lying down, the bayonet is fixed and unfixed in the most expeditious and convenient manner and the piece returned to the original position.

Fix and unfix bayonet are executed with promptness and regularity but not in cadence.

78. CHARGE BAYONET. Whether executed at halt or in motion, the bayonet is held toward the opponent as in the position of **guard** in the Manual for Bayonet Exercise.

Plate 14 (par. 79).

Exercises for instruction in bayonet combat are prescribed in the Manual for Bayonet Exercise.

THE INSPECTION

79. Being at order arms: 1. **Inspection,** 2. **ARMS.**

At the second command take the position of port arms. **(TWO)** Seize the bolt handle with

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the thumb and forefinger of the right hand, turn the handle up, draw the bolt back, and glance at the chamber. Having found the chamber empty, or having emptied it, raise the head and eyes to the front.

80. Being at inspection arms: 1. **Order (Right shoulder, port),** 2. **ARMS.**

At the preparatory command push the bolt forward, turn the handle down, pull the trigger, and resume **port arms.** At the command **arms,** complete the movement ordered.

TO DISMISS THE SQUAD

81. Being at halt: 1. **Inspection,** 2. **ARMS,** 3. **Port,** 4. **ARMS,** 5. **DISMISSED.**

IV

Infantry

Introduction

82. Success in battle is the ultimate object of all military training; success may be looked for only when the training is intelligent and thorough.

83. Commanding officers are accountable for the proper training of their respective organizations within the limits prescribed by regulations and orders.

The excellence of an organization is judged by its field efficiency. The field efficiency of an organization depends primarily upon its effectiveness as a whole. Thoroughness and uniformity in the training of the units of an organization are indispensable to the efficiency of the whole; it is by such means alone that the requisite teamwork may be developed.

84. Simple movements and elastic formations are essential to correct training for battle.

85. The Drill Regulations are furnished as a guide. They provide the principles for training and for increasing the probability of success in battle.

In the interpretation of the regulations, the spirit must be sought. Quibbling over the minutiæ of form is indicative of failure to grasp the spirit.

86. The following important distinctions must be observed:

(a) Drills executed at **attention** and the ceremonies are **disciplinary exercises** designed to teach

precise and soldierly movement, and to inculcate that prompt and subconscious obedience which is essential to proper military control. To this end, smartness and precision should be exacted in the execution of every detail. Such drills should be frequent, but short.

(b) The purpose of **extended order drill** is to teach the **mechanism** of development, of the firings, and, in general, of the employment of troops in combat. Such drills are in the nature of disciplinary exercises and should be frequent, thorough, and exact in order to habituate men to the firm control of their leaders.

Extended order drill is executed **at ease.** The company is the largest unit which executes extended order drill.

(c) **Field exercises** are for instruction in the duties incident to campaign. Assumed situations are employed.

Each exercise should conclude with a discussion, on the ground, of the exercise and principles involved.

(d) The **combat exercise, a form of field exercise** of the company, battalion, and larger units, consists of the **application of tactical principles** to assumed situations, employing in the execution the appropriate formations and movements of close and extended order.

The firing line can rarely be controlled by the voice alone; thorough training to insure the proper use of prescribed signals is necessary.

The exercise should be followed by a brief drill at attention in order to restore smartness and control.

87. In field exercises the enemy is said to be **imaginary** when his position and force are merely assumed; **outlined** when his position and force are indicated by a few men; **represented** when a body of troops acts as such.

GENERAL RULES FOR DRILLS AND FORMATIONS

88. When the **preparatory** command consists of more than one part, its elements are arranged as follows:

(1) For movements to be executed successively by the subdivisions or elements of an organization: (a) Description of the movement; (b) how executed, or on what element executed.

(2) For movements to be executed simultaneously by the subdivisions of an organization: (a) The designation of the subdivisions; (b) the movement to be executed.

89. Movements that may be executed toward either flank are explained as toward but one flank, it being necessary to substitute the word "left" for "right," and the reverse, to have the explanation of the corresponding movement toward the other flank. The commands are given for the execution of the movements toward either flank. The substitute word of the command is placed within parentheses.

90. Any movement may be executed either from the halt or when marching, unless otherwise prescribed. If at a halt, the command for movements involving marching need not be prefaced by **forward,** as 1. **Column right (left),** 2. **MARCH.**

91. Any movement not specially excepted may be executed in double time.

If at a halt or if marching in quick time, the command **double time** precedes the command of execution.

92. In successive movements executed in double time the leading or base unit marches in **quick time** when not otherwise prescribed; the other units march in **double time** to their places in the formation ordered and then conform to the gait of the leading or base unit. If marching in double

time, the command **double time** is omitted. The leading or base unit marches in **quick time**; the other units continue at double time to their places in the formation ordered and then conform to the gait of the leading or base unit.

93. To hasten the execution of a movement begun in quick time, the command: 1. **Double time,** 2. **MARCH,** is given. The leading or base unit continues to march in quick time, or remains at halt if already halted; the other units complete the execution of the movement in double time and then conform to the gait of the leading or base unit.

94. To stay the execution of a movement when marching, for the correction of errors, the command: 1. **In place,** 2. **HALT,** is given. All halt and stand fast, without changing the position of the pieces. To resume the movement the command: 1. **Resume,** 2. **MARCH,** is given.

To revoke a preparatory command, or, being at a halt, to begin anew a movement improperly begun, the command, **AS YOU WERE,** is given, at which the movement ceases and the former position is resumed.

95. Unless otherwise announced, the guide of a company or subdivision of a company in line is **right**; of a battalion in line or line of subdivisions or of a deployed line, **center**; of a rank in column of squads, toward the side of the guide of the company.

To march with guide other than as prescribed above, or to change the guide: **Guide (right, left, or center).**

In successive formations into line, the guide is toward the point of rest; in platoons or larger subdivisions it is so announced.

The announcement of the guide, when given in connection with a movement, follows the command of execution for that movement. Excep-

tion: 1. **As skirmishers, guide right (left or center).** 2. **MARCH.**

96. The turn on the fixed pivot by subdivisions is used in all formations from line into column and the reverse.

The turn on the moving pivot is used by subdivisions of a column in executing changes of direction.

Partial changes of direction may be executed:

By interpolating in the preparatory command the word **half** as **Column half right (left), or Right (left) half turn.** A change of direction of 45° is executed.

By the command: **INCLINE TO THE RIGHT (LEFT).** The guide, or guiding element, moves in the indicated direction and the remainder of the command conforms. This movement effects slight changes of direction.

97. The designations **line of platoons, line of companies, line of battalions,** etc., refer to the formations in which the platoons, companies, battalions, etc., each in column of squads, are in line.

98. Full distance in column of subdivisions is such that in forming line to the right or left the subdivisions will have their proper intervals.

In column of subdivisions the guide of the leading subdivision is charged with the step and direction; the guides in rear preserve the trace, step, and distance.

99. In close order, all details, detachments, and other bodies of troops are habitually formed in double rank.

100. The posts of officers, noncommissioned officers, special units (such as band or machine-gun company), etc., in the various formations of the company, battalion, or regiment, are shown in plates in the Drill Regulations.

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In all changes from one formation to another involving a change of post on the part of any of these, posts are promptly taken by the most convenient route as soon as practicable after the command of execution for the movement; officers and noncommissioned officers who have prescribed duties in connection with the movement ordered, take their new posts when such duties are completed.

As instructors, officers and noncommissioned officers go wherever their presence is necessary. As file closers it is their duty to rectify mistakes and insure steadiness and promptness in the ranks.

101. General, field, and staff officers are habitually mounted. The staff of an officer forms in single rank 3 paces in rear of him, the right of the rank extending 1 pace to the right of a point directly in rear of him. Members of the staff are arranged in order from right to left as follows: General staff officers, adjutant, aids, other staff officers, arranged in each classification in order of rank, the senior on the right. The flag of the general officer and the orderlies are 3 paces in rear of the staff, the flag on the right. When necessary to reduce the front of the staff and orderlies, each line executes **twos right** or **fours right,** as explained in the Cavalry Drill Regulations, and follows the commander.

When not otherwise prescribed, staff officers draw and return saber with their chief.

102. In making the about, an officer, mounted, habitually turns to the left.

When the commander faces to give commands, the staff, flag, and orderlies do not change position.

103. When making or receiving official reports, or on meeting out of doors, all officers will salute.

Military courtesy requires the junior to salute first, but when the salute is introductory to a report made at a military ceremony or formation,

to the representative of a common superior (as for example, to the adjutant, officer of the day, etc.), the officer making the report, whatever his rank, will salute first; the officer to whom the report is made will acknowledge by saluting that he has received and understood the report.

104. Other than for ceremonies, noncommissioned staff officers and orderlies accompany their immediate chiefs unless otherwise directed. If mounted, the noncommissioned staff officers are ordinarily posted on the right or at the head of the orderlies.

105. In all formations and movements a noncommissioned officer commanding a platoon or company carries his piece as the men do, if he is so armed, and takes the same post as an officer in like situation. When the command is formed in line for ceremonies, a noncommissioned officer commanding a company takes post on the right of the right guide after the company has been aligned.

Orders, Commands, and Signals

106. **Commands** only are employed in drill at attention. Otherwise either a **command, signal,** or **order** is employed, as best suits the occasion, or one may be used in conjunction with another.

107. Signals should be freely used in instruction, in order that officers and men may readily know them. In making arm signals the saber, rifle, or headdress may be held in the hand.

108. Officers and men fix their attention at the first word of command, the first note of the bugle or whistle, or the first motion of the signal. A **signal** includes both the preparatory command and the command of execution; the movement commences as soon as the signal is understood, unless otherwise prescribed.

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109. Except in movements executed at **attention**, commanders or leaders of subdivisions repeat orders, commands, or signals whenever such repetition is deemed necessary to insure prompt and correct execution.

Officers, battalion noncommissioned staff officers, platoon leaders, guides, and musicians are equipped with whistles.

The major and his staff will use a whistle of distinct tone; the captain and company musicians a second and distinctive whistle; the platoon leaders and guides a third distinctive whistle.

110. Prescribed signals are limited to such as are essential as a substitute for the voice under conditions which render the voice inadequate.

Before or during an engagement special signals may be agreed upon to facilitate the solution of such special difficulties as the particular situation is likely to develop, but it must be remembered that simplicity and certainty are indispensable qualities of a signal.

ORDERS

111. In these regulations an **order** embraces instructions or directions given orally or in writing in terms suited to the particular occasion and not prescribed herein.

Orders are employed only when the **commands** prescribed herein do not sufficiently indicate the will of the commander.

Orders are more fully described in paragraphs 378 to 383, inclusive, Infantry Drill Regulations, 1911.

COMMANDS

112. In these regulations a **command** is the will of the commander expressed in the phraseology prescribed herein.

113. There are two kinds of commands:

The **preparatory** command, such as **forward,** indicates the movement that is to be executed.

The command of **execution,** such as **MARCH, HALT,** or **ARMS,** causes the execution.

Preparatory commands are distinguished by **small black letters,** those of **execution** by **CAPITALS.**

Where it is not mentioned in the text who gives the commands prescribed, they are to be given by the commander of the unit concerned.

The **preparatory** command should be given at such an interval of time before the command of **execution** as to admit of being properly understood; the command of **execution** should be given at the instant the movement is to commence.

The tone of command is animated, distinct, and of a loudness proportioned to the number of men for whom it is intended.

Each **preparatory** command is enunciated distinctly, with a rising inflection at the end and in such manner that the command of **execution** may be more energetic.

The command of **execution** is firm in tone and brief.

114. Majors and commanders of units larger than a battalion repeat such commands of their superiors as are to be executed by their units, facing their units for that purpose. The battalion is the largest unit that executes a movement at the command of execution of its commander.

115. When giving commands to troops it is usually best to face toward them.

Indifference in giving commands must be avoided as it leads to laxity in execution. Commands should be given with spirit at all times.

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BUGLE SIGNALS

116. The authorized bugle signals are published in Part V, Infantry Drill Regulations, 1911.

The following bugle signals may be used off the battle field, when not likely to convey information to the enemy:

Attention: Troops are brought to attention.

Attention to orders: Troops fix their attention.

Forward, march: Used also to execute quick time from double time.

Double time, march.

To the rear, march: In close order execute **squads right about.**

Halt.

Assemble, march.

The following bugle signals may be used on the battle field:

Fix bayonets.

Charge.

Assemble, march.

These signals are used only when intended for the entire firing line; hence they can be authorized only by the commander of a unit (for example, a regiment or brigade) which occupies a distinct section of the battle field. Exception: **Fix bayonet.**

The following bugle signals are used in exceptional cases on the battle field. Their principal uses are in field exercises and practice firing.

Commence firing: Officers charged with fire direction and control open fire as soon as practicable. When given to a firing line, the signal is equivalent to **fire at will.**

Cease firing: All parts of the line execute **cease firing** at once.

These signals are not used by units smaller than a regiment, except when such unit is independent or detached from its regiment.

WHISTLE SIGNALS

117. Attention to orders. A **short blast** of the whistle. This signal is used on the march or in combat when necessary to fix the attention of troops, or of their commanders or leaders, preparatory to giving commands, orders, or signals.

When the firing line is firing each squad leader suspends firing and fixes his attention at a **short blast** of his platoon leader's whistle. The platoon leader's subsequent commands or signals are repeated and enforced by the squad leader. If a squad leader's attention is attracted by a whistle other than that of his platoon leader or if there are no orders or commands to convey to his squad he resumes firing at once.

Suspend firing. A **long blast** of the whistle.

All other whistle signals are prohibited.

ARM SIGNALS

118. The following arm signals are prescribed. In making signals either arm may be used. Officers who receive signals on the firing line "repeat back" at once to prevent misunderstanding.

Forward march. Carry the hand to the shoulder; straighten and hold the arm horizontally, thrusting it in direction of march.

This signal is also used to execute quick time from double time.

Halt. Carry the hand to the shoulder; thrust the hand upward and hold the arm vertically.

Double time, march. Carry the hand to the shoulder; rapidly thrust the hand upward the full extent of the arm several times.

Squads right, march. Raise the arm laterally until horizontal; carry it to a vertical position above the head and swing it several times between the vertical and horizontal positions.

Squads left, march. Raise the arm laterally until horizontal; carry it downward to the side and swing it several times between the downward and horizontal positions.

Squads right about, march (if in close order) or, **To the rear, march** (if in skirmish line). Extend the arm vertically above the head; carry it laterally downward to the side and swing it several times between the vertical and downward positions.

Change direction or **Column right (left), march.** The hand on the side toward which the change of direction is to be made is carried across the body to the opposite shoulder, forearm horizontal; then swing in a horizontal plane, arm extended, pointing in the new direction.

As skirmishers, march. Raise both arms laterally until horizontal.

As skirmishers, guide center, march. Raise both arms laterally until horizontal; swing both simultaneously upward until vertical and return to the horizontal; repeat several times.

As skirmishers, guide right (left), march. Raise both arms laterally until horizontal; hold the arm on the side of the guide steadily in the horizontal position; swing the other upward until vertical and return it to the horizontal; repeat several times.

Assemble, march. Raise the arm vertically to its full extent and describe horizontal circles.

Range, or **Change elevation.** To announce **range,** extend the arm toward the leaders or men for whom the signal is intended, fist closed; by

keeping the fist closed battle sight is indicated; by opening and closing the fist, expose thumb and fingers to a number equal to the hundreds of yards; to add 50 yards describe a short horizontal line with forefinger. **To change elevation,** indicate the **amount of increase** or **decrease** by fingers as above; point upwards to indicate increase and downward to indicate decrease.

What range are you using? or **What is the range?** Extend the arms toward the person addressed, one hand open, palm to the front, resting on the other hand, fist closed.

Are you ready? or **I am ready.** Raise the hand, fingers extended and joined, palm toward the person addressed.

Commence firing. Move the arm extended in full length, hand palm down, several times through a horizontal arc in front of the body.

Fire faster. Execute rapidly the signal "Commence firing."

Fire slower. Execute slowly the signal "Commence firing."

To swing the cone of fire to the right, or left. Extend the arm in full length to the front palm to the right (left); swing the arm to right (left), and point in the direction of the new target.

Fix Bayonet. Simulate the movement of the right hand in "Fix bayonet" (paragraph 76).

Suspend firing. Raise and hold the forearm steadily in a horizontal position in front of the forehead, palm of the hand to the front.

Cease firing. Raise the forearm as in **suspend firing** and swing it up and down several times in front of the face.

Platoon. Extend the arm horizontally toward the platoon leader; describe small circles with the hand. (See par. 119.)

Squad. Extend the arm horizontally toward the platoon leader; swing the hand up and down from the wrist. (See par. 119.)

Rush. Same as **double time.**

Note: For special combat code and two-arm semaphore code, see Chapter VIII.

119. The signals **platoon** and **squad** are intended primarily for communication between the captain and his platoon leaders. The signal **platoon** or **squad** indicates that the platoon commander is to cause the signal which follows to be executed by platoon or squad.

School of the Squad

120. Soldiers are grouped into squads for purposes of instruction, discipline, control, and order.

121. The squad proper consists of a corporal and seven privates.

122. The corporal is the squad leader, and when absent is replaced by a designated private. If no private is designated, the senior in length of service acts as leader.

The corporal, when in ranks, is posted as the left man in the front rank of the squad.

When the corporal leaves the ranks to lead his squad, his rear rank man steps into the front rank, and the file remains blank until the corporal returns to his place in ranks, when his rear rank man steps back into the rear rank.

123. In battle officers and sergeants endeavor to preserve the integrity of squads; they designate new leaders to replace those disabled, organize new squads when necessary, and see that every man is placed in a squad.

Men are taught the necessity of remaining with the squad to which they belong and, in case it be broken up or they become separated therefrom, to

attach themselves to the nearest squad and platoon leaders, whether these be of their own or of another organization.

TO FORM THE SQUAD

124. To form the squad the instructor places himself 3 paces in front of where the center is to be and commands: **FALL IN.**

The men assemble at attention, pieces at the order, and are arranged by the corporal in double rank, as nearly as practicable in order of height from right to left, each man dropping his left hand as soon as the man on his left has his interval. The rear rank forms with distance of 40 inches.

The instructor then commands: **COUNT OFF.**

At this command all except the right file execute **eyes right,** and beginning on the right, the men in each rank count **one, two, three, four;** each man turns his head and eyes to the front as he counts.

Pieces are then inspected.

ALIGNMENTS

125. To align the squad, the base file or files having been established: 1. **Right (Left),** 2. **DRESS,** 3. **FRONT.**

At the command **dress** all men place the left hand upon the hip (whether dressing to the right or left); each man, except the base file, when on or near the new line executes **eyes right,** and, taking steps of 2 or 3 inches, places himself so that his right arm rests lightly against the arm of the man on his right, and so that his eyes and shoulders are in line with those of the men on his right; the rear rank men cover in file.

The instructor verifies the alignment of both ranks from the right flank and orders up or back

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such men as may be in rear, or in advance, of the line; only the men designated move.

At the command **front,** given when the ranks are aligned, each man turns his head and eyes to the front and drops his left hand by his side.

126. To preserve the alignment when marching: **GUIDE RIGHT (LEFT).**

The men preserve their intervals from the side of the guide, yielding to pressure from that side and resisting pressure from the opposite direction; they recover intervals, if lost, by gradually opening out or closing in; they recover alignment by slightly lengthening or shortening the step; the rear-rank men cover their file leaders at 40 inches.

In double rank, the front-rank man on the right, or designated flank, conducts the march; when marching faced to the flank, the leading man of the front rank is the guide.

TO TAKE INTERVALS AND DISTANCES

127. Being in line at halt: 1. **Take interval,** 2. **To the right (left),** 3. **March,** 4. **Squad,** 5. **HALT.**

At the second command the rear-rank men march backward 4 steps and halt; at the command **march** all face to the right and the leading man of each rank steps off; the other men step off in succession, each following the preceding man at 4 paces, rear-rank men marching abreast of their file leaders.

At the command **halt,** given when all have their intervals, all halt and face to the front.

128. Being at intervals, to assemble the squad: 1. **Assemble, to the right (left),** 2. **MARCH.**

The front-rank man on the right stands fast, the rear-rank man on the right closes to 40 inches.

The other men face to the right, close by the shortest line, and face to the front.

129. Being in line at a halt and having counted off: 1. **Take distance,** 2. **MARCH,** 3. **Squad,** 4. **HALT.**

At the command **march** No. 1 of the front rank moves straight to the front; Nos. 2, 3, and 4 of the front rank and Nos. 1, 2, 3, and 4 of the rear rank, in the order named, move straight to the front, each stepping off so as to follow the preceding man at 4 paces. The command **halt** is given when all have their distances.

In case more than one squad is in line, each squad executes the movement as above. The guide of each rank of numbers is right.

130. Being at distances, to assemble the squad: 1. **Assemble,** 2. **MARCH.**

No. 1 of the front rank stands fast; the other numbers move forward to their proper places in line.

TO STACK AND TAKE ARMS

131. Being in line at a halt: **STACK ARMS.**

Each even number of the front rank grasps his piece with the left hand at the upper band and rests the butt between his feet, barrel to the front, muzzle inclined slightly to the front and opposite the center of the interval on his right, the thumb and forefinger raising the stacking swivel; each even number of the rear rank then passes his piece, barrel to the rear, to his file leader, who grasps it between the bands with his right hand and throws the butt about 2 feet in advance of that of his own piece and opposite the right of the interval, the right hand slipping to the upper band, the thumb and forefinger raising the stacking swivel, which he engages with that of his own piece; each odd number of the front rank raises his piece with the right hand, carries

it well forward, barrel to the front; the left hand, guiding the stacking swivel, engages the lower hook of the swivel of his own piece with the free hook of that of the even number of the rear rank; he then turns the barrel outward into the angle formed by the other two pieces and lowers the butt to the ground, to the right of and against the toe of his right shoe.

The stack made, the loose pieces are laid on them by the even numbers of the front rank.

When each man has finished handling pieces, he takes the position of the soldier.

132. Being in line behind the stacks: **TAKE ARMS.**

The loose pieces are returned by the even numbers of the front rank; each even number of the front rank grasps his own piece with the left hand, the piece of his rear-rank man with his right hand, grasping both between the bands; each odd number of the front rank grasps his piece in the same way with the right hand, disengages it by raising the butt from the ground and then, turning the piece to the right, detaches it from the stack; each even number of the front rank disengages and detaches his piece by turning it to the left, and then passes the piece of his rear-rank man to him, and all resume the order.

133. Should any squad have Nos. 2 and 3 blank files, No. 1 rear rank takes the place of No. 2 rear rank in making and breaking the stack; the stacks made or broken, he resumes his post.

Pieces not used in making the stack are termed **loose pieces.**

Pieces are never stacked with the bayonet fixed.

THE OBLIQUE MARCH

134. For the instruction of recruits, the squad being in column or correctly aligned, the instructor

causes the squad to face half right or half left, points out to the men their relative positions, and explains that these are to be maintained in the oblique march.

135. 1. Right (Left) oblique, 2. MARCH.

Each man steps off in a direction 45° to the right of his original front. He preserves his relative position, keeping his shoulders parallel to those of the guide (the man on the right front of the line or column), and so regulates his steps that the ranks remain parallel to their original front.

At the command **halt** the men halt faced to the front.

To resume the original direction: 1. **Forward, 2. MARCH.**

The men half face to the left in marching and then move straight to the front.

If at **half step** or **mark time** while obliquing, the oblique march is resumed by the commands: 1. **Oblique, 2. MARCH.**

TO TURN ON MOVING PIVOT

136. Being in line: 1. **Right (Left) turn, 2. MARCH.**

The movement is executed by each rank successively and on the same ground. At the second command, the pivot man of the front rank faces to the right in marching and takes the half step; the other men of the rank oblique to the right until opposite their places in line, then execute a second right oblique and take the half step on arriving abreast of the pivot man. All glance toward the marching flank while at half step and take the full step without command as the last man arrives on the line.

Right (Left) half turn is executed in a similar manner. The pivot man makes a half change of

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direction to the right and the other men make quarter changes in obliquing.

TO TURN ON FIXED PIVOT

137. Being in line, to turn and march: **1. Squad right (left), 2. MARCH.**

At the second command, the right flank man in the front rank faces to the right in marching and marks time; the other front rank men oblique to the right, place themselves abreast of the pivot, and mark time. In the rear rank the third man from the right, followed in column by the second and first, moves straight to the front until in rear of his front-rank man, when all face to the right in marching and mark time; the other number of the rear rank moves straight to the front four paces and places himself abreast of the man on his right.

Men on the new line glance toward the march-flank while marking time and, as the last man arrives on the line, both ranks execute **forward, march** without command.

138. Being in line to turn and halt: **1. Squad right (left), 2. MARCH, 3. Squad, 4. HALT.**

The third command is given immediately after the second. The turn is executed as prescribed in the preceding paragraph except that all men, on arriving on the new line, mark time until the fourth command is given, when all halt. The fourth command should be given as the last man arrives on the line.

139. Being in line, to turn about and march: **1. Squad right (left) about, 2. MARCH.**

At the second command, the front rank twice executes **squad right,** initiating the second **squad right** when the man on the marching flank has arrived abreast of the rank. In the rear rank the third man from the right, followed by the second

and first in column, moves straight to the front until on the prolongation of the line to be occupied by the rear rank; changes direction to the right; moves in the new direction until in rear of his front-rank man, when all face to the right in marching, mark time, and glance toward the marching flank. The fourth man marches on the left of the third to his new position; as he arrives on the line, both ranks execute **forward, march,** without command.

140. Being in line, to turn about and halt: **1. Squad right (left) about, 2. MARCH, 3. Squad, 4. HALT.**

The third command is given immediately after the second. The turn is executed as prescribed in the preceding paragraph except that all men, on arriving on the new line, mark time until the fourth command is given, when all halt. The fourth command should be given as the last man arrives on the line.

TO FOLLOW THE CORPORAL

141. Being assembled or deployed, to march the squad without unnecessary commands, the corporal places himself in front of it and commands: **FOLLOW ME.**

If in line or skirmish line, No. 2 of the front rank follows in the trace of the corporal at about 3 paces; the other men conform to the movements of No. 2, guiding on him and maintaining their relative positions.

If in column, the head of the column follows the corporal.

TO DEPLOY AS SKIRMISHERS

142. Being in any formation, assembled: **1. As skirmishers, 2. MARCH.**

The corporal places himself in front of the

squad, if not already there. Moving at a run, the men place themselves abreast of the corporal at half-pace intervals, Nos. 1 and 2 on his right, Nos. 3 and 4 on his left, rear-rank men on the right of their file leaders, extra men on the left of No. 4; all then conform to the corporal's gait.

When the squad is acting alone, skirmish line is similarly formed on No. 2 of the front rank, who stands fast or continues the march, as the case may be; the corporal places himself in front of the squad when advancing and in rear when halted.

When deployed as skirmishers, the men march at ease, pieces at the trail unless otherwise ordered.

The corporal is the guide when in the line; otherwise No. 2 front rank is the guide.

143. The normal interval between skirmishers is one-half pace, resulting practically in one man per yard of front. The front of a squad thus deployed as skirmishers is about 10 paces.

TO INCREASE OR DIMINISH INTERVALS

144. If assembled, and it is desired to deploy at greater than the normal interval; or if deployed, and it is desired to increase or decrease the interval: 1. **As skirmishers, (so many) paces,** 2. **MARCH.**

Intervals are taken at the indicated number of paces. If already deployed, the men move by the flank toward or away from the guide.

THE ASSEMBLY

145. Being deployed: 1. **Assemble.** 2. **MARCH.**

The men move toward the corporal and form in their proper places.

If the corporal continues to advance, the men move in double time, form, and follow him.

The assembly while marching to the rear is not executed.

KNEELING AND LYING DOWN

146. If standing: **KNEEL.**

Half face to the right; carry the right toe

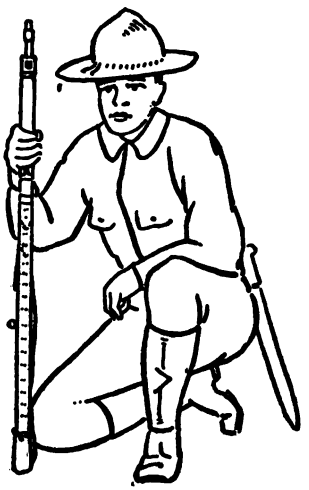

Plate 15 (par. 146).

about 1 foot to the left rear of the left heel; kneel on right knee, sitting as nearly as possible on the right heel; left forearm across left thigh; piece remains in position of order arms, right hand grasping it above the lower band.

147. If standing or kneeling: **LIE DOWN.**

Kneel, but with right knee against left heel; carry back the left foot and lie flat on the belly,

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inclining body about 35° to the right; piece horizontal, barrel up, muzzle off the ground and pointed to the front; elbows on the ground; left hand at the balance, right hand grasping the small of the stock opposite the neck. This is the position of orders arms, lying down.

148. If kneeling or lying down: **RISE.**

If kneeling, stand up, faced to the front, on the ground marked by the left heel.

If lying down raise body on both knees; stand

Plate 16 (par. 147).

up, faced to the front, on the ground marked by the knees.

149. If lying down: **KNEEL.**

Raise the body on both knees; take the position of kneel.

150. In double rank the positions of kneeling and lying down are ordinarily used only for the better utilization of cover.

When deployed as skirmishers a sitting position may be taken in lieu of the position kneeling.

LOADING AND FIRIN

151. The commands for loading and firing are the same whether standing, kneeling, or lying down. The firings are always executed at a halt.

When kneeling or lying down in double rank, the rear rank does not load, aim, or fire.

The instruction in firing will be preceded by a command for loading.

Loadings are executed in line and skirmish line only.

152. Pieces having been ordered loaded are kept loaded without command until the command **unload,** or **inspection arms,** fresh clips being inserted when the magazine is exhausted.

153. The aiming point or target is carefully pointed out. This may be done before or after announcing the sight setting. Both are indicated before giving the command for firing, but may be omitted when the target appears suddenly and is unmistakable; in such case battle sight is used if no sight setting is announced.

154. The target or aiming point having been designated and the sight setting announced, such designation or announcement need not be repeated until a change of either or both is necessary.

Troops are trained to continue their fire upon the aiming point or target designated, and at the sight setting announced, until a change is ordered.

155. If the men are not already in the position of load, that position is taken at the announcement of the sight setting; if the announcement is omitted, the position is taken at the first command for firing.

156. When deployed, the use of the sling as an aid to accurate firing is discretionary with each man.

TO LOAD

157. Being in line or skirmish line at halt: 1. **With dummy (blank or ball) cartridges,** 2. **LOAD.**

At the command **load** each front-rank man or **skirmisher** faces half right and carries the right foot to the right, about 1 foot, to such position

as will insure the greatest firmness and steadiness of the body; raises, or lowers, the piece and drops it into the left hand at the balance, left thumb extended along the stock, muzzle at the height of the breast, and turns the cut-off up. With the right hand he turns and draws the bolt back, takes a loaded clip and inserts the end in the clip slots,

Plate 17 (par. 157).

Plate 18 (par. 157)

places the thumb on the powder space of the top cartridge, the fingers extending around the piece and tips resting on the magazine floor plate; forces the cartridges into the magazine by pressing down with the thumb; without removing the clip, thrusts the bolt home, turning down the handle; turns the safety lock to the "safe" and carries the hand to the small of the stock. Each rear rank man moves to the right front, takes a similar position opposite the interval to the right of his front rank man, muzzle of the piece extending beyond the front rank, and loads.

A skirmish line may load while moving, the pieces being held as nearly as practicable in the position of load.

If kneeling or sitting, the position of the piece is similar; if kneeling, the left forearm rests on the left thigh; if sitting the elbows are supported by the knees. If lying down, the left hand steadies and supports the piece at the balance, the top of the butt resting on the ground, the muzzle off the ground.

For reference, these positions (standing, kneeling, and lying down) are designated as that of **load.**

158. For instruction in loading: 1. **Simulate,** 2. **LOAD.**

Executed as above described except that the cut-off remains "off" and the handling of cartridges is simulated.

The recruits are first taught to **simulate** loading and firing; after a few lessons dummy cartridges may be used. Later, blank cartridges may be used.

159. The rifle may be used as a single loader by turning the magazine "off." The magazine may be filled in whole or in part while "off" or "on" by pressing cartridges singly down and back until they are in the proper place. The use of the rifle as a single loader is, however, to be regarded as exceptional.

TO UNLOAD

160. UNLOAD.

Take the position of load, turn the safety lock up and move bolt alternately back and forward until all the cartridges are ejected. After the last cartridge is ejected the chamber is closed by first thrusting the bolt slightly forward to free it from the stud holding it in place when the chamber is

open, pressing the follower down and back to engage it under the bolt and then thrusting the bolt home; the trigger is pulled. The cartridges are then picked up, cleaned, and returned to the belt and the piece is brought to the order.

TO SET THE SIGHT

161. RANGE, ELEVEN HUNDRED (EIGHT-FIFTY, etc.), or BATTLE SIGHT.

The sight is set at the elevation indicated. The instructor explains and verifies sight settings.

TO FIRE BY VOLLEY

162. 1. READY, 2. AIM, 3. Squad, 4. FIRE.

At the command **ready** turn the safety lock to the "ready;" at the command **aim** raise the piece with both hands and support the butt firmly against the hollow of the right shoulder, right thumb clasping the stock, barrel horizontal, left elbow well under the piece, right elbow as high as the shoulder; incline the head slightly forward and a little to the right, cheek against the stock, left eye closed, right eye looking through the notch of the rear sight so as to perceive the object aimed at, second joint of forefinger resting lightly against the front of the trigger and taking up the slack; top of front sight is carefully raised into, and held in, the line of sight.

Each rear-rank man aims through the interval to the right of his file leader and leans slightly forward to advance the muzzle of his piece beyond the front rank.

In aiming kneeling, the left elbow rests on the left knee, point of elbow in front of kneecap. In aiming sitting, the elbows are supported by the knees.

In aiming lying down, raise the piece with both hands; rest on both elbows and press the butt firmly against the right shoulder.

At the command **fire** press the finger against the

Plate 19 (par. 162).

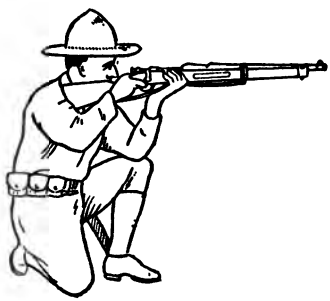


Plate 20 (par. 162).

Plate 21 (par. 162).

trigger; fire without deranging the aim and without lowering or turning the piece; lower the piece in the position of **Load** and load.

163. To continue the firing: **1. AIM, 2. Squad, 3. FIRE.**

Each command is executed as previously ex-

plained. **Load** (from magazine) is executed by drawing back and thrusting home the bolt with the right hand, leaving the safety lock at the "ready."

TO FIRE AT WILL

164. FIRE AT WILL.

Each man, independently of the others, comes to the **ready,** aims carefully and deliberately at the aiming point or target, **fires, loads,** and continues the firing until ordered to **suspend** or **cease firing.**

165. To increase (decrease) the rate of fire in progress the instructor shouts: **FASTER (SLOWER).**

Men are trained to fire at the rate of about three shots per minute at effective ranges and five or six at close ranges, devoting the minimum of time to loading and the maximum to deliberate aiming. To illustrate the necessity for deliberation, and to habituate men to combat conditions, small and comparatively indistinct targets are designated.

TO FIRE BY CLIP

166. CLIP FIRE.

Executed in the same manner as **fire at will,** except that each man, after having exhausted the cartridges then in the piece, **suspends firing.**

TO SUSPEND FIRING

167. The instructor blows a **long blast** of the whistle and repeats same, if necessary, or commands: **SUSPEND FIRING.**

Firing stops; pieces are held, loaded and locked, in a position of readiness for instant resumption of firing, rear sights unchanged. The men continue to observe the target or aiming point, or

the place at which the target disappeared, or at which it is expected to reappear.

This whistle signal may be used as a preliminary to **cease firing.**

TO CEASE FIRING

168. CEASE FIRING.

Firing stops; pieces not already there are brought to the position of load, the cut-off turned down if firing from magazine, the cartridge is drawn or the empty shell is ejected, the trigger is pulled, sights are laid down, and the piece is brought to the order.

Cease firing is used for long pauses to prepare for changes of position or to steady the men.

169. Commands for suspending or ceasing fire may be given at any time after the preparatory command for firing whether the firing has actually commenced or not.

THE USE OF COVER

170. The recruit should be given careful instruction in the individual use of cover.

It should be impressed upon him that, in taking advantage of natural cover, he must be able to fire easily and effectively upon the enemy; if advancing on an enemy, he must do so steadily and as rapidly as possible; he must conceal himself as much as possible while firing and while advancing. While setting his sight he should be under cover or lying prone.

171. To teach him to fire easily and effectively, at the same time concealing himself from the view of the enemy, he is practiced in simulating firing in the prone, sitting, kneeling, and crouching positions, from behind hillocks, trees, heaps of earth or rocks, from depressions, gullies, ditches, doorways, or windows. He is taught to fire around

the right side of his concealment whenever possible, or, when this is not possible, to rise enough to fire over the top of his concealment.

When these details are understood, he is required to select cover with reference to an assumed enemy and to place himself behind it in proper position for firing.

172. The evil of remaining too long in one place, however good the concealment, should be explained. He should be taught to advance from cover to cover, selecting cover in advance before leaving his concealment.

It should be impressed upon him that a man running rapidly toward an enemy furnishes a poor target. He should be trained in springing from a prone position behind concealment, running at top speed to cover and throwing himself behind it. He should also be practiced in advancing from cover to cover by crawling, or by lying on the left side, rifle grasped in the right hand, and pushing himself forward with the right leg.

173. He should be taught that, when fired on while acting independently, he should drop to the ground, seek cover, and then endeavor to locate his enemy.

174. The instruction of the recruit in the use of cover is continued in the combat exercises of the company, but he must then be taught that the proper advance of the platoon or company and the effectiveness of its fire is of greater importance than the question of cover for individuals. He should also be taught that he may not move about or shift his position in the firing line except the better to see the target.

OBSERVATION

175. The ability to use his eyes accurately is of great importance to the soldier. The recruit

should be trained in observing his surrounding from positions and when on the march.

He should be practiced in pointing out and naming military features of the ground; in distinguishing between living beings; in counting distant groups of objects or beings; in recognizing colors and forms.

176. In the training of men in the mechanism of the firing line, they should be practiced in repeating to one another target and aiming point designations and in quickly locating and pointing out a designated target. They should be taught to distinguish, from a prone position, distant objects, particularly troops, both with the naked eye and with field glasses. Similarly, they should be trained in estimating distances.

School of the Company

177. The captain is responsible for the theoretical and practical instruction of his officers and noncommissioned officers, not only in the duties of their respective grades, but in those of the next higher grades.

178. The company in line is formed in double rank with the men arranged, as far as practicable, according to height from right to left, the tallest on the right.

The original division into squads is effected by the command: **COUNT OFF.** The squads, successively from the right, count off as in the School of the Squad, corporals placing themselves as Nos. 4 of the front rank. If the left squad contains less than six men, it is either increased to that number by transfers from other squads or is broken up and its members assigned to other squads and posted in the line of file closers. These squad organizations are maintained, by transfers if necessary, until the company becomes so re-

duced in numbers as to necessitate a new division into squads. No squad will contain less than six men.

179. The company is further divided into two, three, or four platoons, each consisting of not less than two nor more than four squads. In garrison or ceremonies the strength of platoons may exceed four squads.

180. At the formation of the company the platoons or squads are numbered consecutively from right to left and these designations do not change.

For convenience in giving commands and for reference, the designations, **right, center, left,** when in line, and **leading, center, rear,** when in column, are applied to platoons or squads. These designations apply to the actual right, left, center, head, or rear, in whatever direction the company may be facing. The **center squad** is the middle or right middle squad of the company.

The designation "So-and-so's" squad or platoon may also be used.

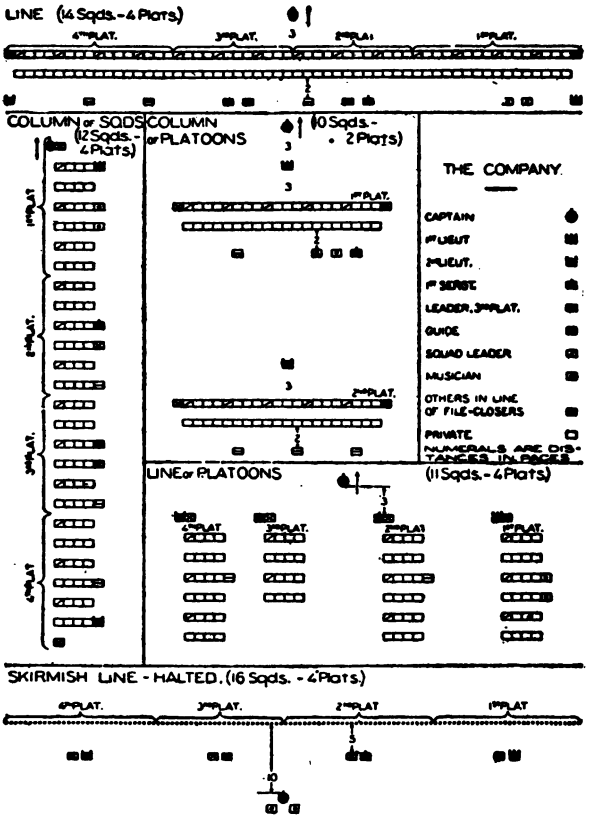
181. Platoons are assigned to the lieutenants and noncommissioned officers, in order of rank, as follows: 1, right; 2, left; 3, center (right center); 4, left center.

The noncommissioned officers next in rank are assigned as guides, one to each platoon. If sergeants still remain, they are assigned to platoons as additional guides. When the platoon is deployed, its guide, or guides, accompany the platoon leader.

During battle, these assignments are not changed; vacancies are filled by noncommissioned officers of the platoon, or by the nearest available officers or noncommissioned officers arriving with reenforcing troops.

182. The first sergeant is never assigned as a guide. When not commanding a platoon, he is

posted as a file closer opposite the third file from the outer flank of the first platoon; and when



Formation of the Company.

the company is deployed he accompanies the captain.

The quartermaster sergeant, when present, is assigned according to his rank as a sergeant.

Enlisted men below the grade of sergeant, armed with the rifle, are in ranks unless serving as guides; when not so armed, they are posted in the line of file closers.

Musicians, when required to play, are at the head of the column. When the company is deployed, they accompany the captain.

183. The company executes the **halt, rests, facings, steps** and **marchings, manual of arms, loadings** and **firings, takes intervals** and **distances** and **assembles, increases** and **diminishes intervals,** resumes **attention, obliques,** resumes the direct march, preserves alignments, **kneels, lies down, rises, stacks** and **takes arms,** as explained in the Schools of the Soldier and the Squad, substituting in the commands **company** for **squad.**

The same rule applies to platoons, detachments, details, etc., substituting their designation for **squad** in the commands. In the same manner these execute the movements prescribed for the company, whenever possible, substituting their designation for **company** in the commands.

184. A company so depleted as to make division into platoons impracticable is led by the captain as a single platoon, but retains the designation of company. The lieutenants and first sergeant assist in fire control; the other sergeants place themselves in the firing line as skirmishers.

Close Order

RULES

185. The guides of the right and left, or leading and rear, platoons, are the right and left, or leading and rear, guides, respectively, of the com-

pany when it is in line or in column of squads. Other guides are in the line of file closers.

In platoon movements the post of the platoon guide is at the head of the platoon, if the platoon is in column, and on the guiding flank if in line. When a platoon has two guides their original assignment to flanks of the platoon does not change.

186. The guides of a column of squads place themselves on the flank opposite the file closers. To change the guides and file closers to the other flank, the captain commands: 1. **File closers on left (right) flank;** 2. **MARCH.** The file closers dart through the column; the captain and guides change.

In column of squads, each rank preserves the alignment toward the side of the guide.

187. Men in the line of file closers do not execute the loadings or firings.

Guides and enlisted men in the line of file closers execute the manual of arms during the drill unless specially excused, when they remain at the order. During ceremonies they execute all movements.

188. In **taking intervals and distances,** unless otherwise directed, the right and left guides, at the first command, place themselves in the line of file closers, and, with them, take a distance of 4 paces from the rear rank. In taking intervals, at the command **march,** the file closers face to the flank and each steps off with the file nearest him. In **assembling** the guides and file closers resume their positions in line.

189. In movements executed simultaneously by platoons (as **platoons right** or **platoons, column right**), platoon leaders repeat the preparatory command (**platoon right,** etc.), applicable to their respective platoons. The command of execution is given by the captain only.

TO FORM THE COMPANY

190. At the sounding of the assembly the first sergeant takes position 6 paces in front of where the center of the company is to be, faces it, draws saber, and commands: **FALL IN.**

The right guide of the company places himself, facing to the front, where the right of the company is to rest, and at such point that the center of the company will be 6 paces from and opposite the first sergeant; the squads form in their proper places on the left of the right guide, superintended by the other sergeants, who then take their posts.

The first sergeant commands: **REPORT.** Remaining in position at the order, the squad leaders, in succession from the right, salute and report: **All present;** or, **Private(s) ——— absent.** The first sergeant does not return the salutes of the squad leaders; he then commands: 1. **Inspection,** 2. **ARMS,** 3. **Order,** 4. **ARMS,** faces about, salutes the captain, reports: **Sir, all present or accounted for,** or the names of the unauthorized absentees, and, without command, takes his post.

If the company cannot be formed by squads, the first sergeant commands: 1, **Inspection,** 2. **ARMS,** 3. **Right shoulder,** 4. **ARMS,** and calls the roll. Each man, as his name is called, answers **here** and executes order arms. The sergeant then effects the division into squads and reports the company as prescribed above.

The captain places himself 12 paces in front of the center of, and facing, the company in time to receive the report of the first sergeant, whose salute he returns, and then draws saber.

The lieutenants take their posts when the first sergeant has reported and draw saber with the captain. The company, if not under arms, is formed in like manner omitting reference to arms.

191. For the instruction of platoon leaders and guides, the company, when small, may be formed in single rank. In this formation close order movements only are executed. The single rank executes all movements as explained for the front rank of a company.

TO DISMISS THE COMPANY

192. Being in line at a halt, the captain directs the first sergeant: **Dismiss the company.** The officers fall out; the first sergeant places himself faced to the front, 3 paces to the front and 2 paces from the nearest flank of the company, salutes, faces toward opposite flank of the company, and commands: 1, **Inspection,** 2. **ARMS,** 3. **Port,** 4. **ARMS,** 5. **DISMISSED.**

ALIGNMENTS

193. The alignments are executed as prescribed in the School of the Squad, the guide being established instead of the flank file. The rear-rank man of the flank file keeps his head and eyes to the front and covers his file leader.

At each alignment the captain places himself in prolongation of the line, 2 paces from and facing the flank toward which the dress is made, verifies the alignment, and commands: **FRONT.**

Platoon leaders take a like position when required to verify alignments.

MOVEMENTS ON THE FIXED PIVOT

194. Being in line, to turn the company: 1, **Company right (left),** 2. **MARCH,** 3. **Company,** 4. **HALT**; or, 3. **Forward,** 4. **MARCH.**

At the second command the right-flank man in the front rank faces to the right in marching and marks time; the other front-rank men oblique to

the right, place themselves abreast of the pivot, and mark time; in the rear rank the third man from the right, followed in column by the second and first, moves straight to the front until in rear of his front-rank man, when all face to the right in marching and mark time; the remaining men of the rear rank move straight to the front 4 paces, oblique to the right, place themselves abreast of the third man, cover their file leaders, and mark time; the right guide steps back, takes post on the flank, and marks time.

The fourth command is given when the last man is 1 pace in rear of the new line.

The command **halt** may be given at any time after the movement begins; only those halt who are in the new position. Each of the others halts upon arriving on the line, aligns himself to the right, and executes **front** without command.

195. Being in line, to form column of platoons, or the reverse: 1. **Platoons right (left),** 2. **MARCH,** 3. **Company,** 4. **HALT;** or, 3. **Forward,** 4. **MARCH.**

Executed by each platoon as described for the company.

Before forming line the captain sees that the guides on the flank toward which the movement is to be executed are covering. This is effected by previously announcing the guide to that flank.

196. Being in line, to form column of squads, or the reverse; or, being in line of platoons, to form column of platoons, or the reverse: 1. **Squads right (left),** 2. **MARCH;** or, 1. **Squads right (left),** 2. **MARCH,** 3. **Company,** 4. **HALT.**

Executed by each squad as described in the School of the Squad.

If the company or platoons be formed in line toward the side of the file closers, they dart through the column and take posts in rear of the company at the second command. If the column

of squads be formed from line, the file closers take posts on the pivot flank, abreast of and 4 inches from the nearest rank.

MOVEMENTS ON THE MOVING PIVOT

197. Being in line, to change direction: **1. Right (left) turn, 2. MARCH, 3. Forward, 4. MARCH.**

Executed as described in the School of the Squad, except that the men do not glance toward the marching flank and that all take the full step at the fourth command.

The right guide is the pivot of the front rank. Each rear-rank man obliques on the same ground as his file leader.

198. Being in column of platoons, to change direction: **1. Column right (left), 2. MARCH.**

At the first command the leader of the leading platoon commands: **Right turn.** At the command march the leading platoon turns to the right on moving pivot; its leader commands: **1. Forward, 2. MARCH,** on completion of the turn. Rear platoons march squarely up to the turning point of the leading platoon and turn at command of their leaders.

199. Being in column of squads, to change direction: **1. Column right (left), 2. MARCH.**

At the second command the front rank of the leading squad turns to the right on moving pivot as in the School of the Squad; the other ranks, without command, turn successively on the same ground and in a similar manner.

200. Being in column of squads, to form line of platoons or the reverse: **1. Platoons, column right (left), 2. MARCH.**

Executed by each platoon as described for the company.

201. Being in line, to form column of squads and change direction: **1. Squads right (left), col-**

umn right (left), 2. MARCH; or, 1. **Right (left) by squads, 2. MARCH.**

In the first case the right squad initiates the **column right** as soon as it has completed the **squad right.**

In the second case, at the command **march,** the right squad marches **forward**; the remainder of the company executes **squads right, column left,** and follows the right squad. The right guide, when he has posted himself in front of the right squad, takes four short steps, then resumes the full step; the right squad conforms.

202. Being in line, to form line of platoons: 1. **Squads right (left), platoons, column right (left), 2. MARCH**; or 1. **Platoons right (left) by squads, 2. MARCH.**

Executed by each platoon as described for the company in the preceding paragraph.

FACING OR MARCHING TO THE REAR

203. Being in line, line of platoons, or in column of platoons or squads, to face or march to the rear: 1. **Squads right (left) about, 2. MARCH**; or, 1. **Squads right (left) about, 2. MARCH, 3. Company, 4. HALT.**

Executed by each squad as described in the School of the Squad.

If the company or platoons be in column of squads, the file closers turn about toward the column, and take their posts; if in line, each darts through the nearest interval between squads.

204. To march to the rear for a few paces: 1. **About, 2. FACE, 3. Forward, 4. MARCH.**

If in line, the guides place themselves in the rear rank, now the front rank; the file closers, on facing about, maintain their relative positions. No other movement is executed until the line is faced to the original front.

ON RIGHT (LEFT) INTO LINE

205. Being in column of platoons or squads, to form line on right or left: 1. **On right (left) into line,** 2. **MARCH,** 3. **Company,** 4. **HALT,** 5. **FRONT.**

At the first command the leader of the leading unit commands: **Right turn.** The leaders of the other units command: **Forward,** if at a halt. At the second command the leading unit turns to the right on moving pivot. The command **halt** is given when the leading unit has advanced the desired distance in the new direction; it halts; its leader then commands: **Right dress.**

The units in rear continue to march straight to the front; each, when opposite the right of its place in line, executes **right turn** at the command of its leader; each is halted on the line at the command of its leader, who then commands: **Right dress.** All dress on the first unit in line.

If executed in double time, the leading squad marches in double time until halted.

FRONT INTO LINE

206. Being in column of platoons or squads, to form line to the front: 1. **Right (left) front into line,** 2. **MARCH,** 3. **Company,** 4. **HALT,** 5. **FRONT.**

At the first command the leaders of the units in rear of the leading one command: **Right oblique.** If at a halt, the leader of the leading unit commands: **Forward.** At the second command the leading unit moves straight forward; the rear units oblique as indicated. The command **halt** is given when the leading unit has advanced the desired distance; it halts; its leader then commands: **Left dress.** Each of the rear units, when opposite its place in line, resumes the original direction at the

command of its leader; each is halted on the line at the command of its leader, who then commands: **Left dress.** All dress on the first unit in line.

207. Being in column of squads to form column of platoons, or being in line of platoons, to form the company in line: **I. Platoons, right (left) front into line, 2. MARCH, 3. Company, 4. HALT, 5. FRONT.**

Executed by each platoon as described for the company. In forming the company in line, the dress is on the left squad of the left platoon. If forming column of platoons, platoon leaders verify the alignment before taking their posts; the captain commands **front** when the alignments have been verified.

When **front into line** is executed in double time the commands for halting and aligning are omitted and the guide is toward the side of the first unit in line.

AT EASE AND ROUTE STEP

208. The column of squads is the habitual column of route, but **route step** and **at ease** are applicable to any marching formation.

209. To march at route step: **1. Route step, 2. MARCH.**

Sabers are carried at will or in the scabbard; the men carry their pieces at will, keeping the muzzles elevated; they are not required to preserve silence, nor to keep step. The ranks cover and preserve their distance. If halted from route step, the men stand **at rest.**

210. To march at ease: 1. **At ease, 2. MARCH.**

The company marches as in route step, except that silence is preserved; when halted, the men remain **at ease.**

211. Marching at route step or at ease: **1. Company, 2. ATTENTION.**

At the command **attention** the pieces are brought to the right shoulder and the cadenced step in quick time is resumed.

TO DIMINISH THE FRONT OF A COLUMN OF SQUADS

212. Being in column of squads: 1. **Right (left) by twos,** 2. **MARCH.**

At the command **march** all files except the two right files of the leading squad execute **in place halt**; the two left files of the leading squad oblique to the right when disengaged and follow the right files at the shortest practicable distance. The remaining squads follow successively in like manner.

213. Being in column of squads or twos: 1. **Right (left) by file,** 2. **MARCH.**

At the command **march,** all files execute **in place halt** except the right file of the leading two or squad. The left file or files of the leading two or squad oblique successively to the right when disengaged and each follows the file on its right at the shortest practicable distance. The remaining twos or squads follow successively in like manner.

214. Being in column of files or twos, to form column of squads; or, being in column of files, to form column of twos: 1. **Squads (Twos), right (left) front into line,** 2. **MARCH.**

At the command **march,** the leading file or files halt. The remainder of the squad, or two, obliques to the right and halts on line with the leading file or files. The remaining squads or twos close up and successively form in rear of the first in like manner.

The movement described in this paragraph will be ordered **right** or **left,** so as to restore the files to their normal relative positions in the two or squad.

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215. The movements prescribed in the three preceding paragraphs are difficult of execution at attention and have no value as disciplinary exercises.

216. Marching by twos or files cannot be executed without serious delay and waste of road space. Every reasonable precaution will be taken to obviate the necessity for these formations.

Extended Order

RULES FOR DEPLOYMENT

217. The command **guide right (left** or **center)** indicates the base squad for the deployment; if in line it designates the actual **right (left** or **center)** squad; if in column the command **guide right (left)** designates the **leading** squad, and the command **guide center** designates the **center** squad. After the deployment is completed, the guide is **center** without command, unless otherwise ordered.

218. At the preparatory command for forming skirmish line, from either column of squads or line, each squad leader (except the leader of the base squad, when his squad does not advance), cautions his squad, **follow me** or **by the right (left) flank,** as the case may be; at the command **march,** he steps in front of his squad and leads it to its place in line.

219. Having given the command for forming skirmish line, the captain, if necessary, indicates to the corporal of the base squad the point on which the squad is to march; the corporal habitually looks to the captain for such directions.

220. The base squad is deployed as soon as it has sufficient interval. The other squads are deployed as they arrive on the general line; each

corporal halts in his place in line and commands or signals, **as skirmishers;** the squad deploys and halts abreast of him.

If tactical considerations demand it, the squad is deployed before arriving on the line.

221. Deployed lines preserve a general alignment towards the guide. Within their respective fronts, individuals or units march so as best to secure cover or to facilitate the advance, but the general and orderly progress of the whole is paramount.

On halting, a deployed line faces to the front (direction of the enemy) in all cases and takes advantage of cover, the men lying down if necessary.

222. The company in skirmish line **advances, halts,** moves **by the flank,** or **to the rear, obliques,** resumes **the direct march,** passes from **quick** to **double time** and the reverse by the same commands and in a similar manner as in close order; if at a halt, the movement **by the flank** or **to the rear** is executed by the same commands as when marching. **Company right (left, half right, half left)** is executed as explained for the front rank, skirmish intervals being maintained.

223. A platoon or other part of the company is deployed and marched in the same manner as the company, substituting in the commands, **platoon (detachment,** etc.) for **company.**

DEPLOYMENTS

224. Being in line, to form skirmish line to the front: 1. **As skirmishers, guide right (left** or **center),** 2. **MARCH.**

If marching, the corporal of the base squad moves straight to the front; when that squad has advanced the desired distance, the captain commands: 1. **Company,** 2. **HALT.** If the guide be

right (left), the other corporals move to the **left (right)** front, and, in succession from the base, place their squads on the line; if the guide be center, the other corporals move to the **right** or **left** front, according as they are on the right or left of the center squad, and in succession from the center squad place their squads on the line.

If at a halt, the base squad is deployed without advancing; the other squads may be conducted to their proper places by the flank; interior squads may be moved when squads more distant from the base have gained comfortable marching distance.

225. Being in column of squads, to form skirmish line to the front: 1. **As skirmishers, guide right (left** or **center),** 2. **MARCH.**

If marching, the corporal of the base squad deploys it and moves straight to the front; if at a halt, he deploys his squad without advancing. If the guide be **right (left),** the other corporals move to the **left (right) front,** and, in succession from the base, place their squads on the line; if the guide be **center,** the corporals in front of the center squad move to the right (if at a halt, to the right rear), the corporals in rear of the center squad move to the left front, and each, in succession from the base, places his squad on the line.

The column of twos or files is deployed by the same commands and in like manner.

226. The company in line or in column of squads may be deployed in an oblique direction by the same commands. The captain points out the desired direction; the corporal of the base squad moves in the direction indicated; the other corporals conform.

227. To form skirmish line to the flank or rear the line or the column of squads is turned by squads to the flank or rear and then deployed as described.

228. The intervals between men are increased or decreased as described in the School of the Squad, adding to the preparatory command, **guide right (left** or **center)** if necessary.

THE ASSEMBLY

229. The captain takes his post in front of, or designates, the element on which the company is to assemble and commands: 1. **Assemble,** 2. **MARCH.**

If in skirmish line the men move promptly toward the designated point and the company is re-formed in line. If assembled by platoons, these are conducted to the designated point by platoon leaders, and the company is re-formed in line.

Platoons may be assembled by the command: 1. **Platoons, assemble,** 2. **MARCH.**

Executed by each platoon as described for the company.

One or more platoons may be assembled by the command: 1. **Such platoon (s), assemble,** 2. **MARCH.**

Executed by the designated platoon or platoons as described for the company.

THE ADVANCE

230. The advance of a company into an engagement (whether for attack or defense) is conducted in close order, preferably column of squads, until the probability of encountering hostile fire makes it advisable to deploy. After deployment, and before opening fire, the advance of the company may be continued in skirmish line or other suitable formation, depending upon circumstances. The advance may often be facilitated, or better advantage taken of cover, or losses reduced by the employment of the **platoon** or **squad columns** or by

the use of a **succession of thin lines.** The selection of the method to be used is made by the captain or major, the choice depending upon conditions arising during the progress of the advance. If the deployment is found to be premature, it will generally be best to assemble the company and proceed in close order.

Patrols are used to provide the necessary security against surprise.

231. Being in skirmish line: 1. **Platoon columns,** 2. **MARCH.**

The platoon leaders move forward through the center of their respective platoons; men to the right of the platoon leader march to the left and follow him in file; those to the left march in like manner to the right; each platoon leader thus conducts the march of his platoon in double column of files; platoon guides follow in rear of their respective platoons to insure prompt and orderly execution of the advance.

232. Being in skirmish line: 1. **Squad columns,** 2. **MARCH.**

Each squad leader moves to the front; the members of each squad oblique toward and follow their squad leader in single file at easy marching distances.

233. Platoon columns are profitably used where the ground is so difficult or cover so limited as to make it desirable to take advantage of the few favorable routes; no two platoons should march within the area of burst of a single shrapnel.[1] **Squad columns** are of value principally in facilitating the advance over rough or brush-grown ground; they afford no material advantage in securing cover.

234. To deploy platoon or squad columns: 1. **As skirmishers,** 2. **MARCH.**

[1] Ordinarily about 20 yards wide.

Skirmishers move to the right or left front and successively place themselves in their original positions on the line.

235. Being in platoon or squad columns: 1. **Assemble,** 2. **MARCH.**

The platoon or squad leaders signal **assemble.** The men of each platoon or squad, as the case may be, advance and, moving to the right and left, take their proper places in line, each unit assembling on the leading element of the column and re-forming in line. The platoon or squad leaders conduct their units toward the element or point indicated by the captain, and to their places in line; the company is re-formed in line.

236. Being in skirmish line, to advance by a succession of thin lines: 1. **(Such numbers), forward,** 2. **MARCH.**

The captain points out in advance the selected position in front of the line occupied. The designated number of each squad moves to the front; the line thus formed preserves the original intervals as nearly as practicable; when this line has advanced a suitable distance (generally from 100 to 250 yards, depending upon the terrain and the character of the hostile fire), a second is sent forward by similar commands, and so on at irregular distances until the whole line has advanced. Upon arriving at the indicated position, the first line is halted. Successive lines, upon arriving, halt on line with the first and the men take their proper places in the skirmish line.

Ordinarily each line is made up of one man per squad and the men of a squad are sent forward in order from right to left as deployed. The first line is led by the platoon leader of the right platoon, the second by the guide of the right platoon and so on in order from right to left.

The advance is conducted in quick time unless conditions demand a faster gait.

The company having arrived at the indicated position, a further advance by the same means may be advisable.

237. The advance in a succession of thin lines is used to cross a wide stretch swept, or likely to be swept, by artillery fire or heavy, long-range rifle fire which can not profitably be returned. Its purpose is the building up of a strong skirmish line preparatory to engaging in a fire fight. This method of advancing results in serious (though temporary) loss of control over the company. Its advantage lies in the fact that it offers a less definite target, hence is less likely to draw fire.

238. The above are suggestions. Other and better formations may be devised to fit particular cases. The best formation is the one which advances the line farthest with the least loss of men, time, and control.

THE FIRE ATTACK

239. The principles governing the advance of the firing line in attack are considered in the School of the Battalion.

When it becomes impracticable for the company to advance as a whole by ordinary means, it advances by rushes.

240. Being in skirmish line: 1. **By platoon (two platoons, squad, four men,** etc.), **from the right (left),** 2. **RUSH.**

The platoon leader on the indicated flank carefully arranges the details for a prompt and vigorous execution of the rush and puts it into effect as soon as practicable. If necessary, he designates the leader for the indicated fraction. When about to rush, he causes the men of the fraction to cease firing and to hold themselves flat, but in readiness to spring forward instantly. The leader of the rush (at the signal of the platoon leader, if the

latter be not the leader of the rush) commands: **Follow me,** and, running at top speed, leads the fraction to the new line, where he halts it and causes it to open fire. The leader of the rush selects the new line if it has not been previously designated.

The first fraction having established itself on the new line, the next like fraction is sent forward by its platoon leader, without further command of the captain, and so on, successively, until the entire company is on the line established by the first rush.

If more than one platoon is to join in one rush, the junior platoon leader conforms to the action of the senior.

A part of the line having advanced, the captain may increase or decrease the size of the fractions to complete the movement.

241. When the company forms a part of the firing line, the rush of the company as a whole is conducted by the captain, as described for a platoon in the preceding paragraph. The captain leads the rush; platoon leaders lead their respective platoons; platoon guides follow the line to insure prompt and orderly execution of the advance.

242. When the foregoing method of rushing, by running, becomes impracticable, any method of advance that **brings the attack closer to the enemy,** such as crawling, should be employed.

For regulations governing the charge, see paragraphs 318 and 319, Infantry Drill Regulations, 1911.

THE COMPANY IN SUPPORT

243. To enable it to follow or reach the firing line, the support adopts suitable formations, following the principles explained in paragraphs 230-236.

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The support should be kept assembled as long as practicable. If after deploying a favorable opportunity arises to hold it for some time in close formation, it should be reassembled. It is redeployed when necessary.

244. The movements of the support as a whole and the dispatch of reenforcements from it to the firing line are controlled by the major.

A reenforcement of less than one platoon has little influence and will be avoided whenever practicable.

The captain of a company in support is constantly on the alert for the major's signals or commands.

245. A reenforcement sent to the firing line joins it deployed as skirmishers. The leader of the reenforcement places it in an interval in the line, if one exists, and commands it thereafter as a unit. If no such suitable interval exists, the reenforcement is advanced with increased intervals between skirmishers; each man occupies the nearest interval in the firing line, and each then obeys the orders of the nearest squad leader and platoon leader.

246. A reenforcement joins the firing line as quickly as possible without exhausting the men.

247. The original platoon division of the companies in the firing line should be maintained and should not be broken up by the mingling of reenforcements.

Upon joining the firing line, officers and sergeants accompanying a reenforcement take over the duties of others of like grade who have been disabled, or distribute themselves so as best to exercise their normal functions. Conditions will vary and no rules can be prescribed. It is essential that all assist in mastering the increasing difficulties of control.

THE COMPANY ACTING ALONE

248. In general, the company, when acting alone, is employed according to the principles applicable to the battalion acting alone; the captain employs platoons as the major employs companies, making due allowance for the difference in strength.

The support may be smaller in proportion or may be dispensed with.

249. The company must be well protected against surprise. Combat patrols on the flanks are specially important. Each leader of a flank platoon details a man to watch for the signals of the patrol or patrols on his flank.

FIRE

250. Ordinarily pieces are loaded and extra ammunition is issued before the company deploys for combat.

In close order the company executes the firings at the command of the captain, who posts himself in rear of the center of the company.

Usually the firings in close order consist of saluting volleys only.

251. When the company is deployed, the men execute the firings at the command of their platoon leaders; the latter give such commands as are necessary to carry out the captain's directions, and, from time to time, add such further commands as are necessary to continue, correct, and control the fire ordered.

252. The voice is generally inadequate for giving commands during fire and must be replaced by signals of such character that proper fire direction and control is assured. To attract attention, signals must usually be preceded by the whistle

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signal (short blast). A fraction of the firing line about to rush should, if practicable, avoid using the long blast signal as an aid to **cease firing.** Officers and men behind the firing line cannot ordinarily move freely along the line, but must depend on mutual watchfulness and the proper use of the prescribed signals. All should post themselves so as to see their immediate superiors and subordinates.

253. The musicians assist the captain by observing the enemy, the target, and the fire effect, by transmitting commands or signals, and by watching for signals.

254. Firing with blank cartridges at an **outlined** or **represented** enemy at distances less than 100 yards is prohibited.

255. The effect of fire and the influence of the ground in relation thereto, and the individual and collective instruction in marksmanship, are treated in the Small-Arms Firing Manual.

RANGES

256. For convenience of reference ranges are classified as follows:

0 to 600 yards, close range.
600 to 1,200 yards, effective range.
1,200 yards to 2,000 yards, long range.
2,000 yards and over, distant range.

257. The distance to the target must be determined as accurately as possible and the sights set accordingly. Aside from training and morale, this is the most important single factor in securing effective fire at the longer ranges.

258. Except in a deliberately prepared defensive position, the most accurate and only practicable method of determining the range will generally be to take the mean of several estimates.

Five or six officers or men, selected from the most accurate estimators in the company, are designated as **range estimators** and are especially trained in estimating distances.

Whenever necessary and practicable, the captain assembles the range estimators, points out the target to them, and adopts the mean of their estimates. The range estimators then take their customary posts.

CLASSES OF FIRING

259. Volley firing has limited application. In defense it may be used in the early stages of the action if the enemy presents a large, compact target. It may be used by troops executing **fire of position.** When the ground near the target is such that the strike of bullets can be seen from the firing line, **ranging volleys** may be used to correct the sight setting.

In combat, volley firing is executed habitually by platoon.

260. Fire at will is the class of fire normally employed in attack or defense.

261. Clip fire has limited application. It is principally used: 1. In the early stages of combat, to steady the men by habituating them to brief pauses in firing. 2. To produce a short burst of fire.

THE TARGET

262. Ordinarily the major will assign to the company an objective in attack or sector in defense; the company's target will lie within the limits so assigned. In the choice of target, tactical considerations are paramount; the nearest hostile troops within the objective or sector will thus be the usual target. This will ordinarily be the hostile firing line; troops in rear are ordinarily proper

targets for artillery, machine guns, or, at times, infantry employing fire of position.

Change of target should not be made without excellent reasons therefor, such as the sudden appearance of hostile troops under conditions which make them more to be feared than the troops comprising the former target.

263. The distribution of fire over the entire target is of special importance.

The captain allots a part of the target to each platoon, or each platoon leader takes as his target that part which corresponds to his position in the company. Men are so instructed that each fires on that part of the target which is directly opposite him.

264. All parts of the target are equally important. Care must be exercised that the men do not slight its less visible parts. A section of the target not covered by fire represents a number of the enemy permitted to fire coolly and effectively.

265. If the target cannot be seen with the naked eye, platoon leaders select an object in front or behind it, designate this as the **aiming target.** and direct a sight setting which will carry the cone of fire into the target.

FIRE DIRECTION

266. When the company is large enough to be divided into platoons, it is impracticable for the captain to command it directly in combat. His efficiency in managing the firing line is measured by his ability to enforce his will through the platoon leaders. Having indicated clearly what he desires them to do, he avoids interfering except to correct serious errors or omissions.

267. The captain **directs** the fire of the company or of designated platoons. He designates the tar-

get, and, when practicable, allots a part of the target to each platoon. Before beginning the fire action he determines the range, announces the sight setting, and indicates the class of fire to be employed and the time to open fire. Thereafter, he observes the fire effect, corrects material errors in sight setting, prevents exhaustion of the ammunition supply, and causes the distribution of such extra ammunition as may be received from the rear.

FIRE CONTROL

268. In combat the platoon is the **fire unit.** From 20 to 35 rifles are as many as one leader can control effectively.

269. Each platoon leader puts into execution the commands or directions of the captain, having first taken such precautions to insure correct sight setting and clear description of the target or aiming target as the situation permits or requires; thereafter, he gives such additional commands or directions as are necessary to exact compliance with the captain's will. He corrects the sight setting when necessary. He designates an aiming point when the target cannot be seen with the naked eye.

270. In general, **platoon leaders** observe the target and the effect of their fire and are on the alert for the captain's commands or signals; they observe and regulate the rate of fire. The **platoon guides** watch the firing line and check every breach of fire discipline. **Squad leaders** transmit commands and signals when necessary, observe the conduct of their squads and abate excitement, assist in enforcing fire discipline and participate in the firing.

271. The best troops are those that submit longest to fire control. Loss of control is an evil which robs success of its greatest results. To

avoid or delay such loss should be the constant aim of all.

Fire control implies the ability to stop firing, change the sight setting and target, and resume a well-directed fire.

FIRE DISCIPLINE

272. "Fire discipline implies, besides a habit of obedience, a control of the rifle by the soldier, the result of training, which will enable him in action to make hits instead of misses. It embraces taking advantage of the ground; care in setting the sight and delivery of fire; constant attention to the orders of the leaders, and careful observation of the enemy; an increase of fire when the target is favorable, and a cessation of fire when the enemy disappears; economy of ammunition."

In combat, shots which graze the enemy's trench or position and thus reduce the effectiveness of his fire have the approximate value of hits; such shots only, or actual hits, contribute toward fire superiority.

Fire discipline implies that, in a firing line without leaders, each man retains his presence of mind and directs effective fire upon the proper target.

273. To create a correct appreciation of the requirements of fire discipline, men are taught that the rate of fire should be as rapid as is consistent with accurate aiming; that the rate will depend upon the visibility, proximity, and size of the target; and that the proper rate will ordinarily suggest itself to each trained man, usually rendering cautions or commands unnecessary.

In attack the highest rate of fire is employed at the halt preceding the assault, and in pursuing fire.

274. In an advance by rushes, leaders of troops in firing positions are responsible for the delivery of heavy fire to cover the advance of each rushing fraction. Troops are trained to change slightly

the direction of fire so as not to endanger the flanks of advanced portions of the firing line.

275. In defense, when the target disappears behind cover, platoon leaders suspend fire, prepare their platoons to fire upon the point where it is expected to reappear, and greet its reappearance instantly with vigorous fire.

Inspections

Company inspection

276. Being in line at a halt: 1. **Open ranks,** 2. **MARCH.**

At the command **march** the front rank executes right dress; the rear rank and the file closers march backward 4 steps, halt, and execute right dress; the lieutenants pass around their respective flanks and take post, facing to the front, 3 paces in front of the center of their respective platoons. The captain aligns the front rank, rear rank, and file closers, takes post 3 paces in front of the right guide, facing to the left, and commands: 1. **FRONT,** 2. **PREPARE FOR INSPECTION.**

At the second command the lieutenants carry saber; the captain returns saber and inspects them, after which they face about, order saber, and stand at ease; upon the completion of the inspection they carry saber, face about, and order saber. The captain may direct the lieutenants to accompany or assist him, in which case they return saber and, at the close of the inspection, resume their posts in front of the company, draw and carry saber.

Having inspected the lieutenants, the captain proceeds to the right of the company. Each man, as the captain approaches him, executes **inspection arms.**

The captain takes the piece, grasping it with his right hand just above the rear sight, the man

dropping his hands. The captain inspects the piece, and, with the hand and piece in the same position as in receiving it, hands it back to the man, who takes it with the left hand at the balance and executes **order arms.**

As the captain returns the piece the next man executes **inspection arms,** and so on through the company.

Should the piece be inspected without handling, each man executes **order arms** as soon as the captain passes to the next man.

The inspection is from right to left in front, and from left to right in rear, of each rank and of the line of file closers.

When approached by the captain the first sergeant executes **inspection saber.** Enlisted men armed with the pistol execute **inspection pistol** by drawing the pistol from the holster and holding it diagonally across the body, barrel up, and 6 inches in front of the neck, muzzle pointing up and to the left. The pistol is returned to the holster as soon as the captain passes.

Upon completion of the inspection the captain takes post facing to the left in front of the right guide and on line with the lieutenants and commands: 1. **Close ranks,** 2. **MARCH.**

At the command **march** the lieutenants resume their posts in line; the rear rank closes to 40 inches, each man covering his file leader; the file closers close to 2 paces from the rear rank.

277. If the company is dismissed, rifles are put away. In quarters headdress and accouterments are removed and the men stand near their respective bunks; in camp they stand covered, but without accouterments, in front of their tents.

If the personal field equipment has not been inspected in ranks and its inspection in quarters or camp is ordered, each man will arrange the prescribed articles on his bunk, if in quarters or

permanent camp, or in front of his half of the tent, if in shelter tent camp, in the same relative order as directed in paragraph 278.

The captain, accompanied by the lieutenants, then inspects the quarters or camp. The first sergeant precedes the captain and calls the men to attention on entering each squad room or on approaching the tents; the men stand at attention, but do not salute.

278. If the inspection is to include an examination of the equipment, the captain, after closing ranks, causes the company to stack arms, to march backward until 4 paces in rear of the stacks and to take intervals. He then commands: 1. **UNSLING EQUIPMENT,** 2. **OPEN PACKS.**

At the first command each man unslings his equipment and places it on the ground at his feet, haversack to the front, end of the pack 1 foot in front of toes.

At the second command, pack carriers are unstrapped, packs removed and unrolled, the longer edge of the pack along the lower edge of the cartridge belt. Each man exposes shelter-tent pins; removes meat can, knife, fork, and spoon from the meat-can pouch, and places them on the right of the haversack, knife, fork, and spoon in the opened meat can; removes the canteen and cup from the cover and places them on the left side of the haversack; unstraps and spreads out haversack so as to expose its contents; folds up the carrier to uncover the cartridge pockets; opens the same; unrolls toilet articles and places them on the outer flap of the haversack; places underwear carried in pack on the left half of the open pack, with round fold parallel with front edge of pack; opens first-aid pouch and exposes contents to view. Special articles carried by individual men, such as flag kit, field glasses, compass, steel tape, notebook, etc., will be arranged on the right

half of the open pack. Each man then resumes the attention.

The captain then passes along the ranks and file closers as before, inspects the equipments, returns to the right, and commands: **CLOSE PACKS.**

Each man rolls up his toilet articles, straps up his haversack and its contents, replaces the meat can, knife, fork, and spoon, and the canteen and cup; closes cartridge pockets and first-aid pouch; rolls up and replaces pack in carrier, and, leaving the equipment in its position on the ground, resumes the position of attention.

All equipments being packed, the captain commands: **SLING EQUIPMENT.**

The equipments are slung and belts fastened.

The captain then causes the company to assemble and take arms. The inspection is completed as already explained.

279. Should the inspector be other than the captain, the latter, after commanding **front,** adds **REST,** and faces to the front. When the inspector approaches, the captain faces to the left, brings the company to attention, faces to the front, and salutes. The salute acknowledged, the captain carries saber, faces to the left, commands: **PREPARE FOR INSPECTION,** and again faces to the front.

The inspection proceeds as before; the captain returns saber and accompanies the inspector as soon as the latter passes him.

Manual of Tent Pitching

SHELTER TENTS

280. Being in line or in column of platoons, the captain commands: **FORM FOR SHELTER TENTS.**

The officers, first sergeant, and guides fall out;

the cooks form a file on the flank of the company nearest the kitchen. the first sergeant and right guide fall in, forming the right file of the company; blank files are filled by the file closers or by men taken from the front rank; the remaining guide, or guides, and file closers form on a convenient flank. Before forming the column of platoons, preparatory to pitching tents, the company may be redivided into two or more platoons, regardless of the size of each.

281. The captain then causes the company to take intervals as described in the School of the Squad, and commands: **PITCH TENTS.**

At the command **pitch tents,** each man steps off obliquely to the right with the right foot and lays his rifle on the ground, the butt of the rifle near the toe of the right foot, muzzle to the front, barrel to the left, and steps back into his place; each front-rank man then draws his bayonet and sticks it in the ground by the outside of the right heel.

Equipments are unslung, packs opened, shelter half and pins removed; each man then spreads his shelter half, small triangle to the rear, flat upon the ground the tent is to occupy, the rear-rank man's half on the right. The halves are then buttoned together; the guy loops at both ends of the lower half are passed through the buttonholes provided in the lower and upper halves; the whipped end of the guy rope is then passed through both guy loops and secured, this at both ends of the tent. Each front-rank man inserts the muzzle of his rifle under the front end of the ridge and holds the rifle upright, sling to the front, heel of butt on the ground beside the bayonet. His rear-rank man pins down the front corners of the tent on the line of bayonets, stretching the tent taut; he then inserts a pin in the eye of the front guy rope and drives the pin at such a distance in front of the

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rifle as to hold the rope taut; both men go to the rear of the tent, each pins down a corner, stretching the sides and rear of the tent before securing; the rear-rank man then inserts an intrenching tool, or a bayonet in its scabbard, under the rear end of the ridge inside the tent, the front-rank man pegging down the end of the rear guy ropes; the rest of the pins are then driven by both men, the rear-rank man working on the right.

The front flaps of the tent are not fastened down, but thrown back on the tent.

As soon as the tent is pitched each man arranges his equipment and the contents of his pack in the tent and stands at attention in front of his own half on line with the front guy-rope pin.

To have a uniform slope when the tents are pitched, the guy ropes should all be of the same length.

In shelter-tent camps, in localities where suitable material is procurable, tent poles may be improvised and used in lieu of the rifle and bayonet or intrenching tool as supports for the shelter tent.

282. When the pack is not carried the company is formed for shelter tents, intervals are taken, arms are laid aside or on the ground, the men are dismissed and proceed to the wagon, secure their packs, return to their places, and pitch tents as heretofore described.

283. Double shelter tents may be pitched by first pitching one tent as heretofore described, then pitching a second tent against the opening of the first, using one rifle to support both tents, and passing the front guy ropes over and down the sides of the opposite tents.

The front corner of one tent is not pegged down, but is thrown back to permit an opening into the tent.

SINGLE SLEEPING BAG

284. Spread the poncho on the ground buttoned end at the feet, buttoned side to the left; fold the blanket once across its short dimension and lay it on the poncho, folded side along the right side of the poncho; tie the blanket together along the left side by means of the tapes provided; fold the left half of the poncho over the blanket and button it together along the side and bottom.

DOUBLE SLEEPING BAG

285. Spread one poncho on the ground, buttoned at the feet, buttoned side to the left; spread the blankets on top of the poncho; tie the edges of the blankets together with the tapes provided; spread a second poncho on top of the blankets, buttoned end at the feet, buttoned side to the right; button the two ponchos together along both sides and across the end.

TO STRIKE SHELTER TENTS

286. The men standing in front of their tents: **STRIKE TENTS.**

Equipments and rifles are removed from the tent; the tents are lowered, packs made up, and equipments slung, and the men stand at attention in the places originally occupied after taking intervals.

287. To pitch all types of army tents, except shelter and conical wall tents: Mark line of tents by driving a wall pin on the spot to be occupied by the right (or left) corner of each tent. For pyramidal tents the interval between adjacent pins should be about 30 feet, which will give a passage of two feet between tents. Spread tripod on the ground where the center of tent is to be, if tripod

is used. Spread the tent on the ground to be occupied, door to the front, and place the right (or left) front wall loop over the pin. The door (or doors, if more than one) being fastened and held together at the bottom, the left (or right) corner wall loop is carried to the left (or right) as far as it will go and a wall pin driven through it, the pin being placed in line with the right (or left) corner pins already driven. At the same time the rear corner wall loops are pulled to the rear and outward so that the rear wall of the tent is stretched to complete the rectangle. Wall pins are then driven through these loops. Each corner pin should be directly in rear of the corresponding front corner pin, making a rectangle. Unless the canvas be wet, a small amount of slack should be allowed before the corner pins are driven. According to the size of the tent one or two men, crawling under the tent if necessary, fit each pole or ridge or upright into the ring or ridge pole holes, and such accessories as hood, fly, and brace ropes are adjusted. If a tripod be used an additional man will go under the tent to adjust it. The tent steadied by the remaining men, one at each corner guy rope, will then be raised. If the tent is a ward or storage type, corner poles will now be placed at the four corners. The four corner guy ropes are then placed over the lower notches of the large pins driven in prolongation of the diagonals at such distance as to hold the walls and ends of the tent vertical and smooth when the guy ropes are drawn taut. A wall pin is then driven through each remaining wall loop and a large pin for each guy rope is driven in line with the corner guy pins already driven. The guy ropes of the tent are placed over the lower notches, while the guy ropes of the fly are placed over the upper notches, and are then drawn taut. Brace ropes, when used, are then secured to stakes or pins suitably placed.

288. Drive the door pin and center pin 8 feet 3 inches apart. Using the hood lines with center pin as center, describe two concentric circles with radii 8 feet 3 inches and 11 feet 3 inches. In the outer circle drive two door guy pins 3 feet apart. At intervals of about 3 feet drive the other guy pin.

In other respects conical tents are erected practically as in the case of pyramidal tents.

TO STRIKE COMMON, WALL, PYRAMIDAL, AND CONICAL WALL TENTS

289. **STRIKE TENTS.**

The men first remove all pins except those of the four corner guy ropes, or the four quadrant guy ropes in the case of the conical wall tent. The pins are neatly piled or placed in their receptacle.

One man holds each guy, and when the ground is clear the tent is lowered, folded, or rolled and tied, the poles or tripod and pole fastened together, and the remaining pins collected.

TO FOLD TENTS

290. For folding common, wall, hospital, and storage tents: Spread the tent flat on the ground, folded at the ridge so that bottoms of side walls are even, ends of tent forming triangles to the right and left; fold the triangular ends of the tent in toward the middle, making it rectangular in shape; fold the top over about 9 inches; fold the tent in two by carrying the top fold over clear to the foot; fold again in two from the top to the foot; throw all guys on tent except the second from each end; fold the ends in so as to cover about two-thirds of the second cloths; fold the left end over to meet the turned-in edge of the right end, then fold the right end over the top, completing the bundle; tie with the two exposed guys.

METHOD OF FOLDING PYRAMIDAL TENT

The tent is thrown toward the rear and the back wall and roof canvas pulled out smooth. This may be most easily accomplished by leaving the rear-corner wall pins in the ground with the wall loops attached, one man at each rear-corner guy, and one holding the square iron in a perpendicular position and pulling the canvas to its limit away from the former front of the tent. This leaves the three remaining sides of the tent on top of the rear side, with the door side in the middle.

Now carry the right-front corner over and lay it on the left-rear corner. Pull all canvas smooth, throw guys toward square iron, and pull bottom edges even. Then take the right-front corner and return to the right, covering the right-rear corner. This folds the right side of the tent on itself, with the crease in the middle and under the front side of tent.

Next carry the left-front corner to the right and back as described above; this when completed will leave the front and rear sides of the tent lying smooth and flat and the two side walls folded inward, each on itself.

Place the hood in the square iron which has been folded downward toward the bottom of tent, and continue to fold around the square iron as a core, pressing all folds down flat and smooth, and parallel with the bottom of the tent. If each fold is compactly made and the canvas kept smooth, the last fold will exactly cover the lower edge of the canvas. Lay all exposed guys along the folded canvas except the two on the center width, which should be pulled out and away from bottom edge to their extreme length for tying. Now, beginning at one end, fold toward the center on the first seam (that joining the first and second widths) and fold again toward the center so that the al-

ready folded canvas will come to within about 3 inches of the middle width. Then fold over to the opposite edge of middle width of canvas. Then begin folding from opposite end, folding the first width in half, then making a second fold to come within about 4 or 5 inches of that, already folded, turn this fold entirely over that already folded. Take the exposed guys and draw them taut across each other, turn bundle over on the under guy, cross guys on top of bundle drawing tight. Turn bundle over on the crossed guys and tie lengthwise.

When properly tied and pressed together this will make a package 11 by 23 by 34 inches, requiring about 8,855 cubic inches to store or pack.

Stencil the organization designation on the lower half of the middle width of canvas in the back wall.

Manual of the Bayonet

United States Army

291. The infantry soldier relies mainly on fire action to disable the enemy, but he should know that personal combat is often necessary to obtain success. Therefore, he must be instructed in the use of the rifle and bayonet in hand-to-hand encounters.

292. The object of this instruction is to teach the soldier how to make effective use of the rifle and bayonet in personal combat; to make him quick and proficient in handling his rifle; to give him an accurate eye and a steady hand; and to give him confidence in the bayonet in offense and defense. When skill in these exercises has been acquired, the rifle will still remain a most formidable weapon at close quarters should the bayonet be lost or disabled.

293. Efficiency of organizations in bayonet fighting will be judged by the skill shown by in-

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dividuals in personal combat. For this purpose pairs or groups of opponents, selected at random from among recruits and trained soldiers, should engage in assaults, using the fencing equipment provided for the purpose.

294. Officers and specially selected and thoroughly instructed noncommissioned officers will act as instructors.

295. Instruction in bayonet combat should begin as soon as the soldier is familiar with the handling of his rifle and will progress, as far as practicable, in the order followed in the text.

296. Instruction is ordinarily given on even ground; but practice should also be had on uneven ground, especially in the attack and defense of intrenchments.

297. These exercises will not be used as a calesthenic drill.

298. The principles of the commands are the same as those given in paragraphs 9, 15, and 38, Infantry Drill Regulations. Intervals and distances will be taken as in paragraphs 109 and 111, Infantry Drill Regulations, except that, in formations for bayonet exercises, the men should be at least four paces apart in every direction.

299. Before requiring soldiers to take a position or execute a movement for the first time, the instructor executes the same for the purpose of illustration, after which he requires the soldiers to execute the movement individually. Movements prescribed in this manual will not be executed in cadence as the attempt to do so results in incomplete execution and lack of vigor. Each movement will be executed correctly as quickly as possible by every man. As soon as the movements are executed accurately, the commands are given rapidly, as expertness with the bayonet depends chiefly upon quickness of motion.

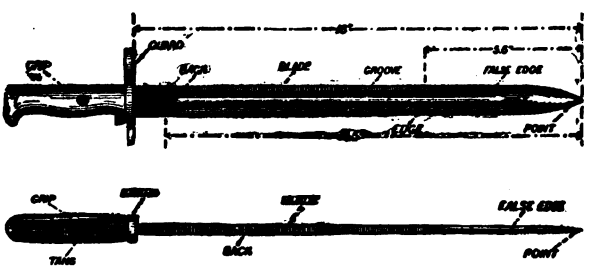
300. The exercises will be interrupted at first by short and frequent rests. The rests will be less frequent as proficiency is attained. Fatigue and exhaustion will be specially guarded against as they prevent proper interest being taken in the exercises and delay the progress of the instruction. Rests will be given from the position of order arms in the manner prescribed in Infantry Drill Regulations.

The Bayonet

NOMENCLATURE AND DESCRIPTION

301. The bayonet is a cutting and thrusting weapon consisting of three principal parts, viz., the **blade, guard,** and **grip.**

302. The blade has the following parts: Edge, false edge, back, grooves, point, and tang. The



length of the blade from guard to point is 16 inches, the edge 14.5 inches, and the false edge 5.6 inches. Length of the rifle, bayonet fixed, is 59.4 inches. The weight of the bayonet is 1 pound; weight of rifle without bayonet is 8.69 pounds. The center of gravity of the rifle, with bayonet fixed, is just in front of the rear sight.

I. Instruction Without the Rifle

303. The instructor explains the importance of good footwork and impresses on the men the fact that quickness of foot and suppleness of body are as important for attack and defense as is the ability to parry and deliver a strong point or cut.

304. All foot movements should be made from the position of **guard.** As far as practicable, they will be made on the balls of the feet to insure quickness and agility. No hard and fast rule can be laid down as to the length of the various foot movements; this depends entirely on the situations occurring in combat.

305. The men having taken intervals or distances, the instructor commands:

1. **Bayonet exercise,** 2. **GUARD.**

At the command **guard,** half face to the right, carry back and place the right foot about once and a half its length to the rear and about 3 inches to the right, the feet forming with each other an angle of about 60°, weight of the body balanced equally on the balls of the feet, knees slightly bent, palms of hands on hips, fingers to the front, thumbs to the rear, head erect, head and eyes straight to the front.

306. To resume the attention, 1. **Squad,** 2. **ATTENTION.** The men take the position of the soldier and fix their attention.

307. ADVANCE. Advance the left foot quickly about once its length, follow immediately with the right foot the same distance.

308. RETIRE. Move the right foot quickly to the rear about once its length, follow immediately with the left foot the same distance.

309. 1. **Front,** 2. **PASS.** Place the right foot quickly about once its length in front of the left,

advance the left foot to its proper position in front of the right.

310. 1. **Rear,** 2. **PASS.** Place the left foot quickly about once its length in rear of the right, retire the right foot to its proper position in rear of the left.

The passes are used to get quickly within striking distance or to withdraw quickly therefrom.

311. 1. **Right,** 2. **STEP.** Step to the right with the right foot about once its length and place the left foot in its proper relative position.

312. 1. **Left,** 2. **STEP.** Step to the left with the left foot about once its length and place the right foot in its proper relative position.

These steps are used to circle around an enemy, to secure a more favorable line of attack, or to avoid the opponent's attack. Better ground or more favorable light may be gained in this way. In bayonet fencing and in actual combat the foot first moved in stepping to the right or left is the one which at the moment bears the least weight.

II. Instruction with the Rifle

313. The commands for and the execution of the foot movements are the same as already given for movements without the rifle.

314. The men having taken intervals or distances, the instructor commands:

1. **Bayonet exercise,** 2. **GUARD.**

At the second command take the position of guard (see par. 305); at the same time throw the rifle smartly to the front, grasp the rifle with the left hand just below the lower band, fingers between the stock and gun sling, barrel turned slightly to the left, the right hand grasping the small of the stock about 6 inches in front of the right hip, elbows free from the body, bayonet point at the height of the chin.

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315. 1. Order, 2. ARMS.

Bring the right foot up to the left and the rifle to the position of order arms, at the same time resuming the position of attention.

316. During the preliminary instruction, attacks and defenses with be executed from guard until

Plates 22 and 23 (pars. 314 and 317).

proficiency is attained, after which they may be executed from any position in which the rifle is held.

ATTACKS

317. 1. THRUST.

Thrust the rifle quickly forward to the full length of the left arm, turning the barrel to the left, and

direct the point of the bayonet at the point to be attacked, butt covering the right forearm. At the same time straighten the right leg vigorously and throw the weight of the body forward and on the left leg, the ball of the right foot always on the ground. Guard is resumed immediately without command.

The force of the thrust is delivered principally with the right arm, the left being used to direct

Plate 24 (par. 318).

the bayonet. The points at which the attack should be directed are, in order of their importance, stomach, chest, head, neck, and limbs.

318. 1. LUNGE.

Executed in the same manner as the thrust, except that the left foot is carried forward about twice its length. The left heel must always be in rear of the left knee. Guard is resumed immediately without command. Guard may also be resumed by advancing the right foot if, for any reason, it is desired to hold the ground gained in lunging.

In the latter case, the preparatory command **forward** will be given. Each method should be practiced.

319. 1. Butt, 2. STRIKE.

Straighten right arm and right leg vigorously and swing butt of rifle against point of attack,

Plate 25 (par. 319).

pivoting the rifle in the left hand at about the height of the left shoulder, allowing the bayonet to pass to the rear on the left side of the head. Guard is resumed without command.

The points of attack in their order of importance are, head, neck, stomach, and crotch.

320. 1. Cut, 2. DOWN.

Execute a quick downward stroke, edge of bayonet directed at point of attack. Guard is resumed without command.

321. 1. Cut, 2. Right (LEFT).

With a quick extension of the arms execute a cut to the right (left), directing the edge toward the point attacked. Guard is resumed without command.

The cuts are especially useful against the head, neck, and hands of an enemy. In executing left cut it should be remembered that the false, or back edge, is only 5.6 inches long. The cuts can be executed in continuation of strokes, thrusts, lunges, and parries.

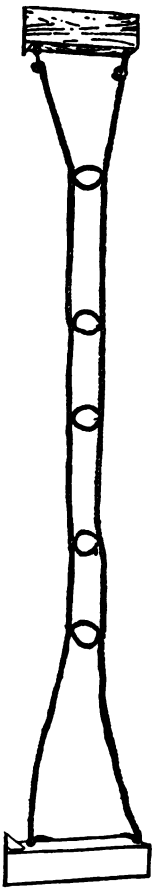
322. To direct an attack to the right, left, or rear the soldier will change front as quickly as possible in the most convenient manner, for example: 1. **To the right rear,** 2. **Cut,** 3. **DOWN;** 1. **To the right,** 2. **LUNGE;** 1. **To the left,** 2. **THRUST,** etc.

Whenever possible the impetus gained by the turning movement of the body should be thrown into the attack. In general this will be best accomplished by turning on the ball of right foot.

These movements constitute a change of front in which the position of guard is resumed at the completion of the movement.

323. Good judgment of distance is essential. Accuracy in thrusting and lunging is best attained by practicing these attacks against rings or other convenient openings, about 3 inches in diameter, suitably suspended at desired heights.

324. The thrust and lunges at rings should first be practiced by endeavoring to hit the opening looked at. This should be followed by directing the attack against one opening while looking at another.



(Par. 323.)

(Par. 326.)

325. The soldier should also experience the effect of actual resistance offered to the bayonet and the butt of the rifle in attacks. This will be taught by practicing attacks against a dummy.

326. Dummies should be constructed in such a manner as to permit the execution of attacks

Plate 26 (par. 330).

Plate 27 (par. 331).

without injury to the point or edge of the bayonet or to the barrel or stock of the rifle. A suitable dummy can be made from pieces of rope about 5 feet in length plaited closely together into a cable between 6 and 12 inches in diameter.

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Old rope is preferable. Bags weighted and stuffed with hay, straw, shavings, etc., are also suitable.

DEFENSES

327. In the preliminary drills in the defenses the position of guard is resumed, by command, after each parry. When the men have become proficient, the instructor will cause them to resume the position of guard instantly without command after the execution of each parry.

328. 1. **Parry,** 2. **RIGHT.**

Keeping the right hand in the guard position, move the rifle sharply to the right with the left arm, so that the bayonet point is about 6 inches to the right.

329. 1. **Parry,** 2. **LEFT.**

Move the rifle sharply to the left front with both hands so as to cover the point attacked.

330. 1. **Parry,** 2. **HIGH.**

Raise the rifle with both hands high enough to clear the line of vision, barrel downward, point of the bayonet to the left front.

When necessary to raise the rifle well above the head, it may be supported between the thumb and forefinger of the left hand. This position will be necessary against attacks from higher elevations, such as men mounted or on top of parapets.

331. 1. **Low parry,** 2. **RIGHT (LEFT).**

Carry the point of the bayonet down until it is at the height of the knee, moving the point of the bayonet sufficiently to the right (left) to keep the opponent's attacks clear of the point threatened.

These parries are rarely used, as an attack below the waist leaves the head and body exposed.

332. Parries must not be too wide or sweeping, but sharp, short motions, finished with a jerk or quick catch. The hands should, as far as possible, be kept in the line of attack. Parries against butt

strike are made by quickly moving the guard so as to cover the point attacked.

333. To provide against attack from the right, left, or rear the soldier will change front as quickly as possible in the most convenient manner; for

Plates 28 and 29 (pars. 331 and 334).

example: 1. **To the left rear,** 2. **Parry,** 3. **HIGH;** 1. **To the right,** 2. **Parry,** 3. **RIGHT,** etc.

These movements constitute a change of front in which the position of guard is resumed at the completion of the movement.

In changing front for the purpose of attack or defense, if there is danger of wounding a comrade, the rifle should first be brought to a vertical position.

III. Instruction Without the Bayonet

334. 1. Club rifle, 2. SWING.

Being at order arms, at the preparatory command quickly raise and turn the rifle, regrasping

Plate 30 (par. 334).

it with both hands between the rear sight and muzzle, barrel down, thumbs around the stock and toward the butt; at the same time raise the rifle above the shoulder farthest from the opponent, butt elevated and to the rear, elbows

slightly bent and knees straight. Each individual takes such position of the feet, shoulders, and hands as best accords with his natural dexterity. **SWING.** Tighten the grasp of the hands and swing the rifle to the front and downward, directing it at the head of the opponent and immediately return to the position of **club rifle** by completing the swing of the rifle downward and to the rear. Repeat by the command, **SWING.**

The rifle should be swung with sufficient force to break through any guard or parry that may be interposed.

Being at **club rifle,** order arms is resumed by command.

The use of this attack against dummies or in fencing is prohibited.

335. The position of **club rifle** may be taken from any position of the rifle prescribed in the Manual of Arms. It will not be taken in personal combat unless the emergency is such as to preclude the use of the bayonet.

IV. Combined Movements

336. The purpose of combined movements is to develop more vigorous attacks and more effective defenses than are obtained by the single movements; to develop skill in passing from attack to defense and the reverse. Every movement to the front should be accompanied by an attack, which is increased in effectiveness by the forward movement of the body. Every movement to the rear should ordinarily be accompanied by a parry and should always be followed by an attack. Movements to the right or left may be accompanied by attacks or defenses.

337. Not more than three movements will be used in any combination. The instructor should first indicate the number of movements that are

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to be combined as **two movements** or **three movements.** The execution is determined by one command of execution, and the position of guard is taken upon the completion of the last movement only.

EXAMPLES

Front pass and LUNGE.
Right step and THRUST.
Left step and low parry RIGHT.
Rear pass, parry left and LUNGE.
Lunge and cut RIGHT.
Parry right and parry HIGH.
Butt strike and cut DOWN.
Thrust and parry HIGH.
Parry high and LUNGE.
Advance, thrust and cut RIGHT.
Right step, parry left and cut DOWN.
To the left, butt strike and cut DOWN.
To the right rear, cut down and butt STRIKE.

338. Attacks against dummies will be practiced. The approach will be made against the dummies both in quick time and double time.

V. Practical Bayonet Combat

339. The principles of practical bayonet combat should be taught as far as possible during the progress of instruction in bayonet exercises.

340. The soldier must be continually impressed with the extreme importance of the offensive due to its moral effect. Should an attack fail, it should be followed immediately by another attack before the opponent has an opportunity to assume the offensive. Keep the opponent on the defensive. If, due to circumstances, it is necessary to take the defensive, constantly watch for an opportunity to assume the offensive and take immediate advantage of it.

341. Observe the ground with a view to obtaining the best footing. Time for this will generally be too limited to permit more than a single hasty glance.

342. In personal combat watch the opponent's eyes if they can be plainly seen, and do not fix the eyes on his weapon nor upon the point of your attack. If his eyes can not be plainly seen, as in night attacks, watch the movements of his weapon and of his body.

343. Keep the body well covered and deliver attacks vigorously. The point of the bayonet should always be kept as nearly as possible in the line of attack. The less the rifle is moved upward, downward, to the right, or to the left, the better prepared the soldier is for attack or defense.

344. Constantly watch for a chance to attack the opponent's left hand. His position of guard will not differ materially from that described in paragraph 314. If his bayonet is without a cutting edge, he will be at a great disadvantage.

345. The butt is used for close and sudden attacks. It is particularly useful in riot duty. From the position of port arms a sentry can strike a severe blow with the butt of the rifle.

346. Against a man on foot, armed with a sword, be careful that the muzzle of the rifle is not grasped.

All the swordsman's energies will be directed toward getting past the bayonet. Attack him with short, stabbing thrusts, and keep him beyond striking distance of his weapon.

347. The adversary may attempt a greater extension in the thrust and lunge by quitting the grasp of his piece with the left hand and advancing the right as far as possible. When this is done, a sharp parry may cause him to lose con-

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trol of his rifle, leaving him exposed to a counter attack, which should follow promptly.

348. Against odds a small number of men can fight to best advantage by grouping themselves so as to prevent their being attacked from behind.

349. In fighting a mounted man armed with a saber every effort must be made to get on his near or left side, because here his reach is much shorter and his parries much weaker. If not possible to disable such an enemy, attack his horse and then renew the attack on the horseman.

350. In receiving night attacks the assailant's movements can be best observed from the kneeling or prone position, as his approach generally brings him against the sky line. When he arrives within attacking distance rise quickly and lunge well forward at the middle of his body.

VI. Fencing Exercises

351. Fencing exercises in two lines consist of combinations of thrusts, parries, and foot movements executed at command or at will, the opponent replying with suitable parries and returns.

352. The instructor will inspect the entire fencing equipment before the exercise begins and assure himself that everything is in such condition as will prevent accidents.

353. The men equip themselves and form in two lines at the order, facing each other, with intervals of about 4 paces between files and a distance of about 2 paces between lines. One line is designated as number 1; the other, number 2. Also as attack and defense.

354. The opponents being at the order facing each other, the instructor commands: **SALUTE.**

Each man with eyes on his opponent, carries the left hand smartly to the right side, palm of the hand down, thumb and fingers extended and joined forearm horizontal, forefinger touching the bayonet. (Two.) Drop the arm smartly by the side.

This salute is the fencing salute.

All fencing exercises and all fencing at will between individuals will begin and terminate with the formal courtesy of the fencing salute.

355. After the fencing salute has been rendered the instructor commands: 1. **Fencing exercise,** 2. **GUARD.**

At the command **guard** each man comes to the position of **guard,** heretofore defined, bayonets crossed, each man's bayonet bearing lightly to the right against the corresponding portion of the opponent's bayonet. This position is known as the **engage** or **engage right.**

356. Being at the **engage right: ENGAGE LEFT.**

The attack drops the point of his bayonet quickly until clear of his opponent's rifle and describes a semicircle with it upward and to the right; bayonets are crossed similarly as in the **engaged** position, each man's bayonet bearing lightly to the left against the corresponding portion of the opponent's bayonet.

357. Being at the **engage left: ENGAGE RIGHT.**

The attack quickly drops the point of his bayonet until clear of his opponent's rifle and describes a semicircle with it upward and to the left and **engages.**

358. Being **engaged: ENGAGE LEFT AND RIGHT.**

The attack **engages left** and then immediately **engages right.**

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359. Being **engaged left: ENGAGE RIGHT AND LEFT.**

The attack **engages right** and then immediately **engages left.**

360. 1. **Number one, ENGAGE RIGHT (LEFT);** 2. **Number two, COUNTER.**

Number one executes the movement ordered, as above; number two quickly drops the point of his bayonet and circles it upward to the original position.

361. In all fencing while maintaining the pressure in the engage, a certain freedom of motion of the rifle is allowable, consisting of the play, or up-and-down motion, of one bayonet against the other. This is necessary to prevent the opponent from divining the intended attack. It also prevents his using the point of contact as a pivot for his assaults. In changing from one engage to the other the movement is controlled by the left hand, the right remaining stationary.

362. After some exercise in **engage, engage left,** and **counter,** exercises will be given in the **assaults.**

ASSAULTS

363. The part of the body to be attacked will be designated by name, as head, neck, chest, stomach, legs. No attacks will be made below the knees. The commands are given and the movements for each line are first explained thoroughly by the instructor; the execution begins at the command **assault.** Number one executes the attack, and number two parries; conversely, at command, number two attacks and number one parries.

364. For convenience in instruction **assaults** are divided into **simple attacks, counterattacks, attacks on the rifle,** and **feints.**

SIMPLE ATTACKS

365. Success in these attacks depends on quickness of movement. There are three simple attacks—the **straight**, the **disengagement**, and the **counterdisengagement**. They are not preceded by a feint.

366. In the **straight** the bayonet is directed straight at an opening from the engaged position. Contact with the opponent's rifle may, or may not, be abandoned while making it. If the opening be high or low, contact with the rifle will usually be abandoned on commencing the attack. If the opening be near his guard, the light pressure used in the engage may be continued in the attack.

Example: Being at the **engage right**, 1. **Number one, at neck** (head, chest, right leg, etc.), **thrust**; 2. **Number two, parry right**; 3. **ASSAULT.**

367. In the **disengagement** contact with the opponent's rifle is abandoned and the point of the bayonet is circled **under** or **over** his bayonet or rifle and directed into the opening attacked. This attack is delivered by one continuous spiral movement of the bayonet from the moment contact is abandoned.

Example: Being at the **engage right**, 1. **Number one,** at stomach (left chest, left leg, etc.), **thrust**; 2. **Number two, parry, left** (etc.); **ASSAULT.**

368. In the **counterdisengagement** a swift attack is made into the opening disclosed while the opponent is attempting to change the engagement of his rifle. It is delivered by one continuous spiral movement of the bayonet into the opening.

Example: Being at the **engage right**, 1. **Number two, engage left**; 2. **Number one,** at chest, **thrust**; 3. **Number two, parry left**; 4. **ASSAULT.**

Number two initiates the movement, number one thrusts as soon as the opening is made, and number two then attempts to parry.

369. A **counterattack** or **return** is one made instantly after or in continuation of a parry. The parry should be as narrow as possible. This makes it more difficult for the opponent to recover and counterparry. The counterattack should also be made at, or just before, the full extension of the opponent's attack, as when it is so made, a simple extension of the arms will generally be sufficient to reach the opponent's body.

Example: Being at **engage**, 1. **Number two,** at chest, **lunge**; 2. **Number one, parry right,** and at stomach (chest, head, etc.), **thrust**; 3. **ASSAULT.**

ATTACKS ON THE RIFLE

370. These movements are made for the purpose of forcing or disclosing an opening into which an attack can be made. They are the **press,** the **beat,** and the **twist.**

371. In the **press** the attack quickly presses against the opponent's bayonet or rifle with his own and continues the pressure as the attack is delivered.

Example: Being at the **engage,** 1. **Number one, press,** and at chest, **thrust**; 2. **Number two, parry right**; 3. **ASSAULT.**

372. The attack by **disengagement** is particularly effective following **the press.**

Example: Being at the **engage,** 1. **Number one, press,** and at stomach, **thrust**; 2. **Number two, low parry left**; 3. **ASSAULT.**

373. The **beat** is an attack in which a sharp blow is struck against the opponent's rifle for the purpose of forcing him to expose an opening into which an attack immediately follows. It is used

when there is but slight opposition or no contact of rifles.

Example: Being at the **engage**, 1. **Number one, beat, and** at stomach (chest, etc.), **thrust**; 2. **Number two, parry left**; 3. **ASSAULT.**

374. In the **twist** the rifle is crossed over the opponent's rifle or bayonet and his bayonet forced downward with a circular motion and a straight attack made into the opening. It requires superior strength on the part of the attack.

Example: Being at the **engage**, 1. **Number one, twist**, and at stomach, **thrust**; 2. **Number two, low parry, left**; 3. **ASSAULT.**

FEINTS

375. Feints are movements which threaten or simulate attacks and are made with a view to inducing an opening or parry that exposes the desired point of attack. They are either single or double, according to the number of such movements made by the attack.

376. In order that the attack may be changed quickly, as little force as possible is put into a feint.

Example: Being at the **engage, Number one, feint** head **thrust**; at stomach, **lunge**; 2. **Number two, parry right and low parry right**; 3. **ASSAULT.**

Number one executes the feint and then the attack. Number two executes both parries.

377. In double feints first one part of the body and then another is threatened and a third attacked.

Example: Being at the **engage**, 1. **Number one, feint straight thrust** at chest; **disengagement** at chest; at stomach, **lunge**; 2. **Number two, parry right, parry left,** and **low parry left**; 3. **ASSAULT.**

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378. An opening may be offered or procured by opposition, as in the **press** or **beat.**

379. In fencing exercises every feint should at first be parried. When the defense is able to judge or divine the character of the attack the feint is not necessarily parried, but may be nullified by a counterfeint.

380. A **counterfeint** is a feint following the opponent's feint or following a parry of his attack and generally occurs in combined movements.

COMBINED MOVEMENTS

381. When the men have become thoroughly familiar with the various foot movements, parries, guards, attacks, feints, etc., the instructor combines several of them and gives the commands in quick succession, increasing the rapidity and number of movements as the men become more skillful. Opponents will be changed frequently.

1. Example: Being at the **engage,** 1. **Number one, by disengagement** at chest, **thrust;** 2. **Number two, parry left, right step** (left foot first), and **lunge;** 3. **ASSAULT.**

2. Example: Being at **engage left, Number one, press** and **lunge;** 2. **Number two, parry right, left step,** and **thrust;** 3. **ASSAULT.**

3. Example: Being at the **engage, Number one, by disengagement** at chest, **thrust;** 2. **Number two, parry left, front pass,** and at head **butt strike;** 3. **Number one, right step;** 4. **ASSAULT.**

382. Examples 1 and 2 are typical of movements known as **cross counters,** and example No. 3 of movements known as **close counters.**

383. A **chancery** is an attack by means of which the opponent is disarmed, which causes him to lose control of his rifle, or which disables his weapon.

384. When the different combinations are executed with sufficient skill the instructor will devise series of movements to be memorized and executed at the command **assault.** The accuracy and celerity of the movements will be carefully watched by the instructor, with a view to the correction of faulty execution.

385. It is not intended to restrict the number of movements, but to leave to the discretion of company commanders and the ingenuity of instructors the selection of such other exercises as accord with the object of the drill.

VII. Fencing at Will

386. As satisfactory progress is made the instructor will proceed to the exercises at will, by which is meant assaults between two men, each endeavoring to hit the other and to avoid being hit himself. Fencing at will should not be allowed to degenerate into random attacks and defenses.

387. The instructor can supervise but one pair of combatants at a time. Frequent changes should be made so that the men may learn different methods of attack and defense from each other.

388. The contest should begin with simple, careful movements, with a view to forming a correct opinion of the adversary; afterwards everything will depend on coolness, rapid and correct execution of the movements and quick perception of the adversary's intentions.

389. Continual retreat from the adversary's attack and frequent dodging to escape attacks should be avoided. The offensive should be continually encouraged.

390. In fencing at will, when no commands are given, opponents facing each other at the position or order arms, salute. They then immediately and simultaneously assume the position of guard,

rifles engaged. Neither man may take the position of guard before his opponent has completed his salute. The choice of position is decided before the salute.

391. The opponents being about two paces part and the fencing salute having been rendered, the instructor commands, **At will, 2. ASSAULT,** after which either party has the right to attack. To interrupt the contest the instructor will command **HALT,** at which the combatants will immediately come to the order. To terminate the contest the instructor will command, 1. **Halt, 2. SALUTE,** at which the combatants will immediately come to the order, salute, and remove their masks.

392. When men have acquired confidence in fencing at will, one opponent should be required to advance upon the other in quick time at **charge bayonet,** from a distance not to exceed 10 yards, and deliver an attack. As soon as a hit is made by either opponent the instructor commands, **HALT,** and the assault terminates. Opponents alternate in assaulting. The assailant is likewise required to advance at double time from a distance not exceeding 20 yards and at a run from a distance not exceeding 30 yards.

393. The instructor will closely observe the contest and decide doubtful points. He will at once stop the contest upon the slightest indication of temper. After conclusion of the combat he will comment on the action of both parties, point out errors and deficiencies and explain how they may be avoided in the future.

394. As additional instruction, the men may be permitted to wield the rifle left handed, that is on the left side of the body, left hand at the small of the stock. Many men will be able to use this method to advantage. It is also of value in case the right hand is wounded.

395. After men have fenced in pairs, practice should be given in fencing between groups, equally and unequally divided. When practicable intrenchments will be used in fencing of this character.

In group fencing it will be necessary to have a sufficient number of umpires to decide hits. An individual receiving a hit is withdrawn at once from the bout, which is decided in favor of the group having the numerical superiority at the end. The fencing salute is not required in group fencing.

RULES FOR FENCING AT WILL

396. 1. Hits on the legs below the knees will not be counted. No hit counts unless, in the opinion of the instructor, it has sufficient force to disable.

2. Upon receiving a hit, call out "hit."

3. After receiving a fair hit a counterattack is not permitted. A position of engage is taken.

4. A second or third hit in a combined attack will be counted only when the first hit was not called.

5. When it is necessary to stop the contest—for example, because of breaking of weapons or displacement of means of protection—take the position of the order.

6. When it is necessary to suspend the assault for any cause, it will not be resumed until adversary is ready and in condition to defend himself.

7. Attacks directed at the crotch are prohibited in fencing.

8. Stepping out of bounds, when established, counts as a hit.

SUGGESTIONS FOR FENCING AT WILL

397. When engaging in an assault, first study the adversary's position and proceed by false attacks, executed with speed, to discover, if possi-

ble, his instinctive parries. In order to draw the adversary out and induce him to expose that part of the body at which the attack is to be made, it is advisable to simulate an attack by a feint and then make the real attack.

398. Return attacks should be frequently practiced, as they are difficult to parry, and the opponent is within easier reach and more exposed. The return can be made a continuation of the parry, as there is no previous warning of its delivery, although it should always be expected. Returns are made without lunging if the adversary can be reached by thrusts or cuts.

399. Endeavor to overcome the tendency to make a return without knowing where it will hit. Making returns blindly is a bad habit and leads to instinctive returns—that is, habitual returns with certain attacks from certain parries—a fault which the skilled opponent will soon discover.

400. Do not draw the rifle back preparatory to thrusting and lunging.

401. The purpose of fencing at will is to teach the soldier as many forms of simple, effective attacks and defenses as possible. Complicated and intricate movements should not be attempted.

HINTS FOR INSTRUCTORS

402. The influence of the instructor is great. He must be master of his weapon, not only to show the various movements, but also to lead in the exercises at will. He should stimulate the zeal of the men and arouse pleasure in the work. Officers should qualify themselves as instructors by fencing with each other.

403. The character of each man, his bodily conformation, and his degree of skill must always be taken into account. When the instructor is demonstrating the combinations, feints, returns, and

parries the rapidity of his attack should be regulated by the skill of the pupil and no more force than is necessary should be used. If the pupil exposes himself too much in the feints and parries the instructor will, by an attack, convince him of his error; but if these returns be too swiftly or too strongly made the pupil will become overcautious and the precision of his attack will be impaired. The object is to teach the pupil, not to give exhibitions of superior skill.

404. Occasionally the instructor should leave himself uncovered and fail to parry, in order to teach the pupil to take quick advantage of such opportunities.

VIII. Competitions

405. In competitions between different organizations none but skillful fencers will be allowed to participate.

406. In contests between two men judges may assign values to hits as follows:

	Thrusts and lunges.	Cuts.	Butt of rifle.
Stomach	4	..	1
Chest	3	..	..
Head	3	2	3
Neck	2	2	2
Legs	1	1	..
Arms and hands	1	1	..

Stepping out of bounds, 4 points.

407. When superiority between two men is decided by bouts, each bout will be decided by itself, i. e., points won in one bout cannot be carried over to another.

408. Details other than those mentioned above will be arranged by the officials of the competition.

V

Cavalry

Based on Cavalry Drill Regulations (1909), Cavalry Service Regulations (1914), and Field Service Regulations (1914).

Introduction

409.

History proves that cavalry is in every respect an indispensable arm of the service.—Prejentsoff.

The most successful cavalry on the battle field has always been that which possessed the power of giving the most effective shock; in other words, the one which united the greatest mobility with the highest power of cohesion and the most effective use of their weapons in the mellay.

Extreme mobility is an essential characteristic of good cavalry.

Cavalry unable to deliver effective dismounted fire action is essentially a dependent arm, unable to act on a tactical defensive, and easily checked by insignificant bodies of hostile infantry well posted in defensive positions. The use of cavalry in reconnaissance, in raids, in pursuit, and in holding defensive positions requires that it should be armed with a good firearm and be expert in its use. In this way only can it act with independence and vigor.—Wagner.

The cavalry like all other arms of the service, has passed through a long process of evolution. In olden times the cavalry was armed with the lance, sword, and dagger, and both man and horse were heavily armored. The charge could be made no faster than the trot. The cavalry was truly immobile. Before the introduction of firearms it

was a rare thing for a cavalryman to lose his life as a result of wounds received in action.

The introduction of firearms completely changed the rôle of cavalry and to-day the greatest requirement is mobility.

The cavalryman of our service, armed as he is, with the saber, rifle, and automatic pistol, is the most completely armed soldier in the world. The saber is his weapon for mounted action, the rifle for dismounted use, and the pistol, the weapon of last resort, is useful at all times for close fighting.

The best authorities have differed as to the best general formation of the cavalry unit, i.e., whether the formation should be in double or single rank. Until the adoption of the Cavalry Service Regulations, 1914 (Experimental), the normal formation was the single rank. The experimental regulation provided for the double rank. It seems that the service in general prefers the single-rank formation.

This volume goes to press simultaneously with the new Drill Regulations for Cavalry in which the legal organization prescribed in the National Defense Act is taken as the basis. For this reason only basic principles governing the employment of cavalry and the training of the trooper will be considered herein.

The Use of Cavalry

410. Mounted action is the main rôle of the cavalry arm and its organization, armament, and instruction should be with a view to rendering it effective in such action.

Dismounted action is, however, a very important rôle of the cavalry, and neither an organization nor the method of instruction which fails to provide for effective use of cavalry dismounted will enable it to perform fully its functions in war.

411. The organization should be such as to permit of the greatest mobility, which is the essential quality of the cavalry, while providing units of great smashing power in the charge and a sufficient number of rifles to make effective its use when required as a dismounted force.

412. Cavalry must maneuver freely and widely without fearing too much for its rear; and being often at a distance from the main body of an army, its commander must be clothed with authority to conform to actual conditions.

413. While the chief task of the cavalry is to assist the other arms in accomplishing the common object, its rôle is often of primary importance. The action of cavalry must be bold and daring; it must, whenever practicable, assume the initiative, seeking out the enemy and placing him upon the defensive.

414. The principal weapon of cavalry in mounted action is the horse and the force of impact should be utilized to the utmost. The terrain and nature of the operations will determine which of the other weapons must be used.

415. When circumstances permit, cavalry opposed to cavalry should fight mounted, thus retaining the mobility and power of maneuver necessary to its security and success.

416. The historical value of cavalry, including the experience and evolution of our own and that of other countries, must be carefully studied, and due consideration should be given to the greater magnitude of our future cavalry operations as compared with our experiences since the Civil War.

417. The use to which cavalry should be put in campaign is summarized as follows:

(a) To seek and destroy the enemy's cavalry.

(b) Screening, contact, and reconnaissance.

(c) Seizing and holding important advanced or isolated positions, thus delaying the advance of the enemy until the arrival of the other arms.

(d) To operate on the flank and in rear of the enemy.

(e) Raids and other enterprises requiring great mobility.

(f) The mounted charge at the opportune moment against infantry or field artillery.

(g) Energetic pursuit of a retreating enemy or covering retreat of its own forces.

(h) When none of the above rôles has been assigned to it, cavalry may go to the assistance (dismounted) of hard-pressed infantry to fill gaps in the firing line.

Training

Basis of the system

418. Two essential principles govern all the mounted evolutions of cavalry:

1. The chief must be able to lead his unit to the attack, remaining constantly the master of its direction and gait.

2. The unit must always preserve the order and cohesion indispensable to its success in the attack, and to this end the movements involved in any evolution must be few and simple.

Instruction of the trooper

419. The instruction of the trooper is conducted in each troop under direction of the captain, who is assisted by his officers and noncommissioned officers according to their several aptitudes and grades. The course of instruction should be so arranged as to bring the trooper to the highest degree of efficiency at the time of the annual maneuvers.

Equitation, the use of arms, and the cultivation of morale are the essential elements.

420. In the daily tasks constant effort should be made to develop in the trooper a taste for physical exercise; to perfect his knowledge of the horse and of his capacity and limitations and of the care that should be given him; and to assure the proper care, fit, and adjustment of the equipment and the habitual care of arms.

421. The instruction in small-arms practice and swordsmanship must be conducted with the view of giving to the trooper complete confidence in his ability to overcome his enemy with whatever weapon he may be called upon to meet him.

422. Before beginning work the instructor should assure himself that those under his charge are neatly dressed in proper uniform, and that horses are properly groomed and equipments in order.

Saddles should be habitually stripped with the exception of the arms required, but sufficient instruction should be given in full field equipment to assure proper preparation for field service.

423. Recruit instruction should receive the special attention of the captain and should be so conducted as to prepare the recruit, as quickly as is consistent with thorough work, to take his place in ranks.

This will be accomplished when the recruit:

(a) Is able to ride his horse on the bit with one hand at all gaits.

(b) Has learned to care for his horse, pack his saddle, and take proper care of his arms and equipments.

(c) Has mastered the use of his arms mounted and dismounted.

(d) Has acquired an elementary knowledge of field service.

The captain is the judge as to when this proficiency has been attained. Undue haste in plac-

ing the recruits in ranks should be avoided, since it leads to loss of time in the school of the platoon and troop.

The School of the Trooper, Dismounted

424. The object of this school is to develop the strength and agility of the trooper to give him a military bearing, to fix in him the habit of sustained attention and instant obedience, to prepare him for instruction in mounted combat with the saber and pistol, and to train him in dismounted combat with the rifle.

This instruction in general is the same as the School of the Soldier, Chapter III. It should be given in the following order: Instruction without arms, individually and by squads, including the position of the soldier, facings, salutes, setting-up exercises, running, jumping, swimming, steps and marchings, manual of the rifle, kneeling and lying down, loadings and firings, the use of cover, observation, manual of the pistol, and manual of the saber.

School of the Trooper, Mounted

425. The object of this school is to train the trooper in horsemanship and in the ready use of his arms while mounted.

This instruction should be given in the following order: elementary training in equitation including, stand to horse, leading, stirrups, mounting and dismounting, handling the reins, position of the trooper mounted, suppling exercises, vaulting, posting, work on the snaffle, work on the bit, use of arms mounted including the manuals of the saber, rifle and pistol, care of horses including rules for the care of horses, stables and stable management, stable duty, grooming, watering, feeding, exercising, sick horses, shoeing; care of saddlery, and fitting the saddle.

The instructor must first develop the confidence of the recruit, supple him, and give him a proper eat. Progress should be suited to his capacity and exempt him as far as practicable from falls or other accidents. This should be followed by instruction in the use of the aids and the means employed to train the horse to obey them.

When the recruit has acquired confidence in his ability to ride and control his horse he should be instructed in the use of arms mounted.

Instruction is given individually; every new movement should be made the object of a particular lesson given successively to each trooper.

Steady, well trained horses are selected for the first lessons. The troopers should exchange horses from time to time during the lesson on indication from the instructor.

There should be frequent rests, especially with recruits. The time may be used profitably in questioning the troopers respecting the instruction they have received.

426. In all exercises the instructor should vary the gait so as not to weary the troopers or the horses. The mounted instruction should be conducted without hurry. The mounted suppling exercises should be practiced during the entire period of instruction.

The exercises should begin and end at a walk.

427. During the exercises the recruits should be taught the rules for the care of horses, until the instructor is satisfied by means of questions that they are thoroughly familiar with them.

THE STANDARD REQUIRED OF MEN AND HORSES

428. To be a good military horseman each trooper should:

(a) Have a strong seat.

(b) Be able to apply correctly the aids by which a horse is controlled.

(c) Be capable of covering long distances on horseback with the least possible fatigue to his horse.

(d) Be able to use his horse to the utmost advantage in a mounted fight.

(e) Be capable of riding across country.

(f) Under proper direction be able to train an unbroken horse and improve a badly trained horse.

(g) Have a practical knowledge of the care of horses both in garrison and in the field, understand how to detect and treat the minor ailments to which they are liable, and be a good groom.

All officers, in addition to being good military horsemen and instructors in riding, must be able to train, and direct the training of, remounts.

429. A trained charger or troop horse must be:

(a) Well balanced and capable of carrying a heavy weight over long distances with minimum loss of condition.

(b) Handy and quick in obeying the correct aids.

(c) Steady, both in and out of ranks.

(d) Capable of being ridden with one hand at any pace either in the company of other horses or alone.

(e) Active on his legs and a good jumper over all kinds of obstacles.

(f) Unafraid of entering deep water or of swimming.

(g) Accustomed to arms.

General Rules

430. For the preparatory exercises the horses are saddled and equipped with the snaffle bit only, saddles stripped. Spurs are not worn.

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These exercises embrace all that is necessary to give the recruit confidence, to supple him, to give him steadiness in the saddle and to prepare him to benefit by instruction in the first principles of equitation.

STAND TO HORSES

431. Each trooper places himself, facing to the front, on the near side of the horse, eyes on a line with the front of the horse's head, so that he can see along the front, and takes the position of attention, except that the right hand, nails down, grasps the reins, the forefinger separating them, about 6 inches from the bit.

TO LEAD OUT

432. The troopers standing to horse, to leave the stable or picket line, the instructor commands: **LEAD OUT.**

Each trooper, holding his hand well up and firm, leads his horse, without looking at him, to the place designated by the instructor.

If the horse shows a disposition to rush or to resist being led, the trooper takes the snaffle reins from the horse's neck, seizes the end of the reins in the left hand, and with the right hand holding the reins near the bit leads the horse as before. When leading through a low or narrow doorway, the horse should be quieted by the voice or caresses and not allowed to pass through hurriedly. To prevent the horse from rushing through a narrow doorway the instructor may direct the trooper to face toward the horse, holding one rein in each hand close to the bit, and lead him by stepping backward; after passing the doorway the trooper leads the horse as before.

433. Upon entering the riding school or inclosure the instructor disposes the troopers upon the middle line at intervals of one horse-length, the

troopers at **stand to horse** and the horses correctly disposed and perpendicular to the line of troopers.

A horse is correctly disposed when he stands squarely on all four feet, having his head, neck, and body in line.

STIRRUPS

434. The stirrups are properly adjusted when, the trooper being properly seated and the legs falling naturally, the tread of the stirrup is about one inch and a half above top of the heel of the shoe.

The stirrups should bear only the weight of the leg; about one-third of the foot should be inserted in the stirrup, so that the ball of the foot rests on the tread, the heel lower than the toe.

To cause the flat of the stirrup strap to rest against the leg the toe is inserted in the stirrup with the front branch on the outside.

Placing too much weight on the stirrup disturbs the seat and contracts the leg, hindering its freedom of action.

If the toe is not inserted far enough the trooper risks losing his stirrup; if inserted too far suppleness is diminished.

The heel is carried naturally lower than the toe if the ankle joint is not rigid.

For the extended gallop, in the charge, for the use of weapons, and for leaping obstacles the foot is inserted fully in the stirrup.

435. The instructor exercises the troopers in casting off and resuming the stirrups, at first at a walk and later at the faster gaits.

He teaches them during the rests while on foot to adjust the stirrups by comparing the length of the strap with that of his arm.

The instructor frequently exercises the troopers in riding without stirrups, especially at the gallop and in leaping obstacles.

TO MOUNT AND DISMOUNT

436. Being at **stand to horse,** at the command **MOUNT,** face to the right, take a step to the right to be opposite the shoulder of the horse; at the same time seize the end of the reins in the right hand and pull them taut enough to give a gentle, even bearing on the horse's mouth; cross the reins flat on the crest and grasp them with the left hand, which also holds a lock of the mane. Place the left foot in the stirrup, assisted by the right hand if necessary, and bring the left knee against the saddle.

Place the right hand upon the cantle, rise by an effort of the right leg aided by the arms, the left knee bent and pressed against the saddle, the upper part of the body inclined slightly forward to prevent the saddle from turning; bring the right foot by the side of the left. Change the right hand to the pommel, pass the right leg, knee bent, over the croup without touching it, and sit down lightly in the saddle. Put the right foot in the stirrup, assisted by the right hand, if necessary; take a rein in each hand, the rein coming into the hand under the little finger and passing out over the second joint of the forefinger, the thumbs closed on the reins, the bight of the reins falling to the right. The reins should be so held that the trooper feels lightly the horse's mouth; the forearms horizontal, wrists straight, elbows to the rear but not held against the sides; hands about 9 inches apart, backs outward.

The instructor takes care that the recruit in adjusting the reins provokes no movement and deranges in no manner the position of the horse's head.

The instructor cautions the trooper to avoid touching the horse with the left toe in mounting;

this fault begets nearly all the resistance of horses to standing quietly while being mounted.

437. At the command **DISMOUNT,** pass the right rein into the left hand and grasp with this hand a lock of the mane; remove the right foot from the stirrup and place the right hand on the pommel. Rise upon the left stirrup, pass the right leg, knee bent, over the croup without touching the horse and bring the right foot by the side of the left (making a slight pause when the rifle is carried), the left knee against the saddle, the upper part of the body inclined slightly forward. Descend lightly to the ground and take the position of **stand to horse.**

The troopers are also trained to mount and dismount on the off side.

TO TAKE THE REINS IN ONE HAND AND TO SEPARATE THEM

438. At the command: **IN LEFT HAND TAKE REINS,** place the left hand opposite the middle of the body, pass the right rein into the left hand, separating it from the left rein by the little finger; let the right hand fall by the side.

439. At the command: **IN BOTH HANDS TAKE REINS,** grasp the right rein with the right hand and replace the hands 9 inches apart.

The reins are taken in the right hand and again separated in a similar manner.

440. To adjust the reins the trooper brings the wrists together and grasps with one hand, above and near the opposite thumb, the rein that he desires to shorten.

441. The instructor causes the reins to be dropped and retaken by the commands **DROP REINS** and **RETAKE REINS.**

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At the first command the trooper drops the reins behind the pommel and lets the hands fall by the side.

The reins are dropped as an exceptional measure and always with precaution against accident.

POSITION OF THE TROOPER, MOUNTED

442. The position described below should be considered a standard toward which all troopers should gradually approximate.

The buttocks bearing equally upon the saddle and as far forward as possible.

The thighs turned without constraint upon their flat side, clasping the horse evenly and stretched only by their own weight and that of the lower legs.

The knees bent and flexible.

The lower legs falling naturally, the calves in contact with the horse without pressure; the toes dropping naturally when the trooper is without stirrups.

The back supple and never hollowed.

The upper part of the body easy, free, and erect.

The shoulders thrown back evenly.

The arms free, the elbows falling naturally.

The head erect without stiffness.

Eyes alert and sweeping the horizon.

The reins held as heretofore described.

This position may be modified by the instructor to suit varying conditions and unusual conformations.

443. The body and the lower legs are movable and should be under the control of the trooper, either acting intermittently as aids for guiding the horse or as a means of combating his resistance, or continuously as a means of binding him to the horse while following his movements.

The thigh, on the other hand, should remain fixed immovably to the saddle except while posting at the trot. This fixity should be obtained, not by the pressure of the knees, but by the clinging of the buttocks, which is secured by the suppleness of the loins and the relaxation of the thighs.

If the buttocks are too far back, the trooper is unable to conform to the movements of the horse and carries forward the upper part of the body. This defect is remedied by sitting well forward in the dip of the saddle.

If the thigh is too nearly horizontal, the trooper is doubled up and his power of action diminished; if the thigh is too nearly vertical, the trooper is on the crotch and lacks ease.

To sum up: The trooper should take a sitting position with the thighs inclined downward.

The various defects of position are overcome by suitable suppling exercises.

POSTING

444. Posting is habitually employed when the troopers have stirrups and understand their use.

It is executed as follows: The horse moving at a trot, the trooper inclines the upper part of his body forward, then supporting himself on the stirrups while maintaining the clinging of his knees, he rises under the impulsion of the horse, maintains his position detached from the saddle while the succeeding impulse is produced, again sits down in the saddle, and continues in this way, always avoiding every other impulse.

At the beginning the mechanism of posting is made easier to the trooper by causing him to stroke the horse's neck or to grasp a lock of the mane with either hand, thus determining the forward inclination of the body.

Its proper execution requires that the seat shall be raised moderately, that contact with the saddle shall be resumed gently and without shock, that the full support of the stirrup is obtained, while keeping the lower leg steady, that the ankle joint shall be supple, and that the heel shall be kept lower than the toe.

TO REST

445. Being at **stand to horse,** the command rest is executed as in the school of the trooper, dismounted, except that the troopers hold the reins and keep their horses in place.

Being mounted, at the halt, at the command: **REST,** or being in march, at the command: **ROUTE ORDER,** the men are permitted to turn their heads, to talk, and to make slight changes of position, but not to lounge on their horses.

Being at **stand to horse,** the command **at ease** is executed as in the school of the trooper, dismounted.

Being mounted, at the command: **AT EASE,** the men are permitted to turn their heads or to make slight changes of position, but preserve silence.

To resume the attention: **ATTENTION.**

Each trooper if dismounted takes the position of stand to horse; if mounted, he takes the position of the trooper mounted.

TO DISMISS

446. The troopers being dismounted, in line: **1. By the right (left, or right and left), 2. FALL OUT.**

The trooper on the right leads his horse 1 yard to the front and then directly to the stable or picket line. Each of the other troopers executes in succession the same movement, so as to follow the horse next on the right, at a distance of 1 yard.

Being in column of files, half-squads, or squads, at the command: **FALL OUT,** the leading trooper or the trooper on the right of each leads out as prescribed and is followed by the other troopers in turn. The troopers remove, clean, and put the equipments in place, and care for and secure their horses under the direction of the instructor.

The instructor, having satisfied himself by inspection that the horses and equipments are properly cared for, and that the precautions required on their return from exercise have been observed, orders the men to fall in, marches them to the squadron parade, and dismisses them as prescribed in the school of the trooper, dismounted.

447. STAND TO HEEL: Each man stands at attention, 1 yard in rear of and facing his heel post. At the picket line he stands at attention, 1 yard in rear of and facing his horse.

THE LEGS AND REINS

448. The means at the disposal of the trooper for controlling the movements and gaits of the horse are called the aids. The most essential are the legs and reins.

449. The legs serve to urge the horse forward, to increase his pace or gait, and to engage the hindquarters or move them laterally. The legs act by the pressure of the calves. If pressure alone is insufficient, the trooper increases the action by blows with his calves.

The spur is used when necessary to add to the power of the leg action. It is essential to obtain from the horse perfect obedience to the action of the legs. He should respond to the simultaneous action of both legs by engaging his hindquarters and moving forward; to the predominant action of one leg by moving his haunches to the oppo-

site side. The action of the leg should cease as soon as obedience is obtained.

450. The reins serve to prepare the horse to move, to slacken or increase his gait, or to change direction.

A slight bearing of the bit on the mouth of the horse is called **contact**; this should be constant.

The reins are held in the full hand, the thumb pressing them lightly upon the second joint of the forefinger. By means of closing and relaxing the fingers and flexing the wrist, arm, and shoulder, the trooper, while maintaining contact and keeping the reins taut, follows easily the movements of the head of the horse without anticipating or interfering with these movements. The hand is then said to be **passive.** It is kept so as long as the trooper is not required to change the gait or direction.

451. In gathering the horse or in increasing or diminishing the gait, the trooper closes his fingers upon the reins without raising the hands and exercises an action from front to rear.

This action should not be continuous; the trooper acts by alternately contracting and relaxing the fingers, the hands remaining low and preserving contact in the intervals between the actions. This is known as the effect of the **direct rein.**

452. The action of the hand in changing direction operates in two ways:

First. When the trooper opens the right rein, the head and neck are drawn toward the right and the horse turns his head to that side. This use of the rein is known as the **open rein.**

The hand should be carried freely to the right, the wrist remaining in prolongation of the forearm, without drawing the rein to the rear.

Second. When the trooper bears the left rein against the neck, the head may be bent to the left, but the neck is pressed to the right and the horse turns in that direction. This is known as the action of the **bearing rein.**

This is the normal use of the reins in changing direction, since the trooper generally has but one hand available for directing his horse.

The bearing rein should act without traction from front to rear and intermittently like the direct rein.

453. All action of the reins should diminish in intensity when obedience to it begins, and cease entirely as soon as the desired result is secured.

454. The instructor, in teaching troopers to avail themselves of their legs and reins, is governed by the preceding considerations, and from the first watches vigilantly the action of the aids.

The hand should always be kept low. The most thoughtful care should be exercised in the combined application of the aids, so that they may not be opposed to each other in their action; that is, one favoring the intended movement, the other opposing it.

During work on the snaffle the troopers are trained in riding with one hand.

TO GATHER THE HORSE

455. Before the horse is required to execute any movement he should be given a preparatory signal. It makes no difference what the movement is to be, the signal is always the same. Its object is to attract his attention and to prepare him for a movement. **This is called gathering the horse.**

Having a light pressure of the bit against the horse's mouth and a light feel of the lower leg

against the horse's side, in order to gather him, increase the pressure of the lower leg against the side, heels well shoved down, and slightly increase the pressure of the bit against the bars by squeezing the fingers on the reins. Increase these two pressures until the elastic movement of the horse under the rider indicates that he has observed the signal.

If, when at a halt, the horse backs, or when marching decreases the gait, the fingers have been contracted too much. If, when at a halt, the horse moves forward, or when marching he increases the pace or gait, the impulse given with the legs has not been met by the fingers.

Each force should exactly balance the other, and the horse, held between the two, should seemingly grow into an elastic body under the rider.

TO MOVE FORWARD AND TO HALT

456. Being at a halt, at the command: **Forward,** the trooper gathers his horse. At the command: **MARCH,** he closes his legs, more or less vigorously according to the sensitiveness of the horse, until the horse moves forward at the walk, the hand remaining passive.

457. Being at the walk, at the command: **HALT,** sit down in the saddle and gather the horse; then increase the pressure of the legs and carry back the weight of the body by curving the back outward and act by the **direct rein** until the horse stops.

As soon as the horse slackens the gait ever so little, relax slightly the pressure of the fingers and legs to reward him for his obedience. Then reapply and again relax until the horse has completed the movement desired.

The men must be impressed with the fact that they increase the pressure of the legs in order to

cause the horse to bring his hind feet up under him to act as brakes in stopping himself. Also that they must carry the weight of the body to the rear to help hold these brakes in place, and that the horse, when the rider closes his legs, steadies him with the reins, and carries his weight to the rear, decreases the gait; while, if the rider closes his legs and slightly carries his weight forward, he increases the gait.

Normally all the tension that is necessary in decreasing the gait is obtained by contracting the fingers on the reins as the body moves to the rear and the hands maintain their relative position to it. If this is not sufficient, turning the wrists will give additional pressure. The elbows should never be carried toward the rear. **In decreasing the gait a steady pull against the mouth must be particularly avoided.**

BY THE RIGHT FLANK

458. 1. By the Right Flank, 2. MARCH. Gather the horse; carry both hands to the right until the horse has turned through an arc of 90° and then replace the hands and move straight in the new direction. During the movement the legs maintain impulsion and hold the horse's body so that it follows the curve on which he is turning—that is, if the horse carries his haunches to the inside of this curve, the action of the inside leg should predominate; if he carries his haunches to the outside of the curve, then the action of the outside leg should predominate.

When the trooper holds the reins in both hands he makes use simultaneously of the **open rein** and the **bearing rein.** With the reins in one hand he makes use of the **bearing rein** only.

The action of the reins in turning is governed by the principles explained in paragraph **452.** The trooper carries the hands in the direction toward

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which he wishes to turn and displaces them only to the extent necessary.

459. The **oblique** represents a half turn to the right or left.

THE TROT

460. The trot is a gait in which the horse springs from one diagonally disposed pair of feet to the other; between the beats all the feet are in the air. The rate of the maneuvering trot is 8 miles per hour or 235 yards per minute. For purposes of individual instruction the rate may be reduced to 6 or 6½ miles per hour by the command: **SLOW TROT.** At the command: **TROT,** the rate of 8 miles per hour is resumed.

The trot alternating with the walk is the gait best adapted for long road marches.

When trotting without stirrups the trooper endeavors to reduce the shock by suppling his back.

THE GALLOP

461. The gallop is the most rapid of the gaits. It must not be used unnecessarily over long distances, particularly on hard roads and when the saddle is packed. However, when the rapidity of the regulation trot is not sufficient, the trooper out of ranks should take the gallop in preference to increasing the speed of the trot.

462. The varieties of the gallop are:

The **maneuvering gallop,** which is at the rate of 12 miles per hour, or 352 yards per minute.

The **extended gallop,** which is at the rate of 16 miles per hour, or 469 yards per minute.

The **school gallop,** which is at the rate of about 8 miles per hour.

The horse is said to gallop on the right foot when the right front and right hind foot are more advanced than the corresponding left feet.

When the feet are advanced in the inverse order the horse is said to gallop on the left foot.

The gallop is marked by three beats and a period of suspension.

If the horse be galloping on the right foot, the first beat is marked by the left hind foot, the second by the nearly simultaneous placing of the right hind and left fore feet, and the third by the placing of the right fore foot.

In galloping on the left foot the beats are, right hind, left hind, and right fore, left fore.

A horse gallops **true** when he gallops on the right foot in turning to the right and on the left foot in turning to the left.

He gallops **false** when he gallops on the left foot in turning to the right, or conversely.

A horse is **disunited** when the gallops lead right with his fore feet and lead left with his hind feet or conversely.

CHANGES OF GAIT

463. To pass from the halt or the walk to the trot or the gallop, the means prescribed for passing from the halt to the walk are employed and continued until the desired gait is taken.

To pass from a higher to a lower gait, or to halt, the means prescribed for passing from the walk to the halt are employed and continued until the desired gait is taken or the horse has stopped.

The commands are:

1. **Trot,** 2. **MARCH;** 1. **Gallop,** 2. **MARCH;** 1. **Walk,** 2. **MARCH;** and **HALT.**

THE ABOUT

464. At the command: 1. **Troopers right** about, 2. **MARCH,** each trooper turns his horse until he finds himself facing in the opposite direction and moves to his new front.

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TO CHANGE HANDS

465. At the command: **CHANGE HANDS,** each trooper after having passed the corner and marched a horse-length on the long side directs himself toward the diagonal corner so as to take the track to the opposite hand and at about two horse-lengths from the corner. Troopers pass those going in an opposite direction by keeping to the right.

CIRCLING INDIVIDUALITY

466. At the command: **TROOPERS CIRCLE TO THE RIGHT,** each trooper describes, in accordance with the principles explained in par. 458, a complete circle tangent to the track, and with a radius less than half the length of the short side, and retakes the track at the point where he quitted it.

The trooper moves his horse on the circle by the means prescribed for moving by the flank.

INCREASING AND DECREASING THE GAIT

467. To increase or decrease the pace or gait the trooper employs the means prescribed for passing from the halt to the walk or from the walk to the halt to the extent necessary to obtain the desired result.

The horse in increasing the pace at the walk increases the amplitude of the movement of his head and neck to the same degree as he increases the length of his step; he accelerates the movement of the head as he increases the cadence of his step.

The trooper aids these movements by yielding the hand and giving the horse greater freedom of movement. He maintains contact with the bit so that he can exercise a gradual restraining in-

fluence with the direct rein when he feels the horse is about to spring into the trot.

To decrease the pace at a walk the trooper makes use of the direct rein and legs as in coming to the halt. The step is shortened and the cadence decreased.

To increase or decrease the pace at the trot the same means are used. The exercises in increasing and decreasing the gait afford excellent practice for the trooper in the use of the aids and good training for the horse in obeying them, but the trooper out of ranks should use only the regulation gaits.

The instructor may cause the pace of the gallop to be increased or decreased in the riding school, but the maneuvering gallop and the extended gallop only should be used in work on long lines.

Changes of pace are executed at the cautions: **SLOW WALK; SLOW TROT; SLOW GALLOP,** and **WALK OUT; TROT OUT; EXTENDED GALLOP.** The normal pace is taken at the commands: **WALK, TROT, GALLOP.**

TO BACK AND HALT

468. 1. **Backward,** 2. **MARCH.** At the first command gather the horse; at the second command use the direct rein until the horse commences to back, then relax the fingers and continue to use the direct rein intermittently to cause the horse to continue to back and to prevent him from rearing.

At the command: **HALT,** cease the action of the hands.

The trooper carefully avoids raising the horse's head. An elevated position of the head, by constraining the muscles of the loins, renders the backward movement much more difficult for the horse.

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If the horse throws his haunches to one side, the trooper increases the action of the rein on that side by opening it widely so as to straighten the horse by **opposing the shoulders** to the haunches. The action of the open rein may be aided or even replaced by that of the bearing rein.

If the horse refuses to back he should be made to take one or two steps forward to flex the muscles of the hindquarters and advantage then be taken of this flexed condition to cause him to back.

469. The training of the trooper in the use of the aids is effected partly by changes of gait, increase and decrease of pace, and partly by the exercises herein described. When the troopers have learned to use the aids correctly the instructor causes them to execute changes of direction combined with changes of gait.

TO LEAVE THE RANKS

470. The instructor places the troopers in single rank near one end of the riding school. The rank is formed by the command: **FORM RANK.** The troopers move by the shortest line, at the walk, or at the gait ordered, and form in single rank in rear of the instructor.

The instructor then causes them to leave the rank individually by calling them by name.

The designated trooper, avoiding abrupt means, rides quietly to the front and moves forward on a line perpendicular to the front of the squad. He takes the track on reaching it, to the hand designated, or halts at a designated spot.

This movement can be executed while the squad is marching at any gait. When the squad is halted the trooper always leaves the rank at the walk, the faster gait, if one is taken, not being begun until the horse has completely left the rank.

The troopers are also practiced in going through the rank both in the direction of its march and in the opposite direction.

These exercises develop the willingness and docility of the horses and it is well to execute them frequently.

The instructor avoids forming the squad parallel to the sides of the riding school or on well-marked lines. He thus inculcates in the trooper the habit of placing himself in the direction of his chief and then directing his horse independently.

JUMPING

471. The object of this instruction is to train the trooper to clear obstacles of every nature that he may encounter on varied terrain, so that he may thus remain, under all circumstances when alone in field, master of his gait and direction.

Jumping is also an excellent means of training the rider; it confirms the seat, increases the pliancy of the hand and arm, strengthens the legs and develops boldness and steadiness.

The work over obstacles should be begun early and continued during the whole course of instruction.

Progress must be regulated prudently and methodically; undue haste is liable to destroy the confidence of the trooper and the willingness of the horse.

This instruction comprises two distinct parts:

The mechanism of jumping.

The conduct of the horse at the obstacle.

472. The troopers are familiarized with the mechanism of jumping by first placing bars on the ground across the track and later low obstacles, and causing the troopers to ride their horses over them without concerning themselves with the conduct of the horses.

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The instructor endeavors in this exercise to cause the troopers to maintain their seats and remain in their saddles by the suppleness of their backs, and, above all, to keep their hands low and passive, thus permitting the horse to use his head and neck in keeping his balance.

The horse that, in going over an obstacle, has the free use of his head and neck, jumps willingly, calmly, and without fatigue. The trooper endeavors to keep in unison with his horse whatever changes in rhythm or pace the latter may make.

The jump is made as follows: On arriving near the obstacle grasp the horse with the legs, keeping the body upright, the hands low and passive; at the moment the horse rises bend the upper part of the body forward at the waist, the buttocks remaining in the saddle; as the horse alights sit well down in the saddle without displacing the hands.

473. When the troopers are sufficiently familiar with the mechanism of jumping and with the use of the aids the instructor teaches them to conduct their horses over obstacles by causing them to jump, individually, obstacles placed off the track.

In general, the horse should jump at the gait at which he approaches the obstacle.

On approaching the obstacle the trooper selects the point at which he wishes to jump and conducts his horse straight toward it, the reins separated, the legs close to maintain the forward movement.

If the horse hesitates on approaching the obstacle, anticipate his resistance by stimulating him vigorously with the legs.

If the horse avoids the obstacle, stop him, quiet him, then take him directly in front of the obstacle and urge him with the legs to make him jump.

If the horse stops short in front of the obstacle ride back and put him at it again.

If the horse bolts or gets out of hand pull him up without, however, hampering him when he takes the leap.

All horses lacking in calmness or willingness should be put back in training over small obstacles.

EXERCISES ON VARIED GROUND

474. The exercises on varied ground have for their object the training of the troopers in riding their horses across country, in making them familiar with obstacles which they will encounter in campaign, and in regulating their gait so as to husband the strength of their horses in covering great distances.

This work is begun at an early period of the training; its difficult features, such as jumping obstacles, are graduated to fit the progress of the trooper, the end being to increase his confidence and skill.

The instructor conducts his class across fields, through woods, and in general over the most varied terrain at his disposal.

He may divide the squad into small groups, each under a corporal, who conducts the group and regulates the gait over a route designated by the instructor.

475. The instructor inculcates in the troopers the principles which should govern them when left to their own devices. They are as follows:

On leaving the stable, move at a walk for a short time in order to get the horse's legs under him.

Vary the gaits but do not depart from the regulation pace prescribed for each.

Choose for the rapid gaits nearly level ground. Going up hill rapidly necessitates great effort on the part of the horse, and going down hill at a

rapid gait exposes him to injuries from the saddle and equipment, and is hard on his forelegs.

Extend progressively the periods at the faster gaits.

Regulate the periods spent at the intermediate gaits by the degree of rapidity with which the total distance must be covered.

Seek, under all circumstances, soft footing, to save the horse's legs, and keep him, therefore, on the edge of metalled roads rather than in the middle.

Choose hard ground when smooth and level in preference to ground that is heavy or uneven.

Finish at a walk, more or less prolonged as the journey has been more or less long and trying, so that the horse shall always come in with a dry skin and normal respiration.

476. To these general principles, which must be practically demonstrated, the instructor adds such counsel as his experience dictates and such remarks as the nature and state of the terrain may render advisable.

The following rules cover the majority of circumstances that will arise:

To ascend a steep slope, yield the hand as soon as the horse has been given his direction; carry forward the upper part of the body and seize a lock of the mane near the middle of the neck under the reins.

To descend a steep slope, let the reins slip through the hand and give the horse complete liberty of action; lean back, and if necessary grasp the cantle with the right hand.

Troopers should be practiced in crossing a V-shaped ditch, about 18 feet wide and 10 feet deep, so that they go down one side and up the other. This is a valuable exercise, as no horse will face the opposite bank unless the head is left free.

Long, steep slopes should be ascended slowly and quietly.

All slopes should be descended directly; short, steep slopes should be ascended directly; long slopes may be ascended obliquely if the surface is not slippery.

In difficult ground, the horse should be allowed to take the initiative; his instincts are a more reliable guide than the aids of the trooper.

If marshy ground must be crossed go slowly and avoid following in trace. If the horse goes down and becomes nervous and begins to plunge, dismount and lead.

The trooper must seek every means to spare his horse, above all when carrying the full pack; where possible to pass natural obstacles without jumping this should be done; the heavily loaded horse crosses many obstacles, for example, wide ditches, with greater security and less effort by climbing than by jumping.

When the bottom of the ditch is boggy it will generally be preferable to jump from bank to bank.

In particularly difficult places, the trooper should dismount and lead, the horse following. All horses should be trained in this method of passing obstacles; a little of this training makes it easy to cross considerable obstructions on foot.

WORK ON THE BIT

Holding and handling the reins.
Use and effect of the bit and snaffle.
Employment of the spur.
Repetition with the bit of the work on the snaffle.
The turn in place.
Work at fixed distances.
Changing the diagonal in posting.
Work on long lines.

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477. Work on the bit is the most important element of the instruction in equitation. The instructor causes this work to be taken up as soon as the troopers have acquired a fair seat and a sufficient knowledge of the use of the aids.

478. The troops at **stand to horse** and in leading holds both reins as prescribed for the snaffle rein. The bit rein is not removed from the horse's neck in leading.

In mounting and dismounting the trooper manipulates both reins as has been prescribed for the snaffle. After dismounting, before leading to the stable or picket line, he unhooks the curb chain.

HOLDING AND HANDLING THE REINS

479. Proper handling of the reins being an important element in horsemanship, the instructor exercises the troopers in it both at a halt and at all gaits.

The normal method of holding the reins for military riders is to take both reins in the left hand. The bit reins are separated by the third (ring) finger, the right snaffle rein between the first and second fingers, the left snaffle rein under the little finger, all of the reins passing out of the hand over the second joint of the first finger, upon which the thumb presses them with sufficient force to hold them in place; the bight falls to the right of the horse's neck. The elbow falls naturally, the wrist and hand in line with the forearm, the finger nails toward the body.

Since the trooper in mounted combat needs the right hand for his weapon (sword or pistol) he must be thoroughly trained in riding with the reins in one hand and in riding on the curb bit.

480. The instructor explains to the troopers that they can:

(a) Ride the horse on the bit, relaxing the snaffle reins, which is the normal method in combat;

(b) Ride the horse on the snaffle, relaxing the bit rein, an exceptional method, used with horses that carry the neck arched, or that have especially sensitive mouths;

(c) Ride the horse on both reins, supporting the horse with both snaffle and bit; this is the normal method used at drill and on the march, at rest and in jumping.

481. When the trooper is not called upon to make immediate use of his arms it is usually advantageous to hold the reins in both hands. In this case he can use the right hand for holding either the right snaffle rein, or both right reins.

To take the right snaffle rein in the right hand, the trooper seizes that rein in front of the left hand with the right hand, the little finger next to the reins, and holds it as when riding with one rein; he places his right hand on a level with the left hand, the bight of the rein coming out under the thumb.

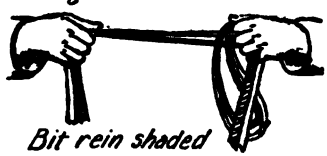
When the trooper wishes to take both right reins in the right hand he holds them in the full grasp, the reins separated by the little finger, snaffle rein underneath. This method is preferably employed in riding across country, in jumping over obstacles, in galloping a horse, etc.

When seizing the right rein or reins in the right hand the left hand allows the reins to slip through the fingers but does not let them go; the two reins passing from the left to the right hand thus form a "bridge" across the horse's neck, a useful thing if the horse stumbles or refuses to jump. This method of holding the reins is taken at the command: **IN BOTH HANDS TAKE REINS.**

During the rests and at route order the troopers alternate in taking the reins in the right hand, the left hand, and both hands. They thus avoid becoming fatigued, advancing the shoulder, or, by carrying the reins to one side, giving to the horse a false carriage of the head and neck. The method for holding the reins in the right hand is similar to that for reins in the left hand.

To allow his horse to ease his head and neck at the walk or at the halt the trooper opens his

Taking reins in both hands



Bit rein shaded

fingers without changing the position of his hand so as to permit complete relaxation.

When the trooper has the sword or pistol in hand he may use the right hand to adjust his reins or to separate them momentarily, but he must exercise great care to keep the point of his sword or the muzzle of his pistol elevated to avoid wounding his neighbors. The troopers must be frequently practiced in riding with the reins in one hand.

482. To adjust the reins, seize them with the thumb and first finger of the right hand above the left thumb; slightly open the fingers of the left hand, raise the right hand, feel lightly and evenly the horse's mouth with both reins and close the fingers of the left hand on the reins.

The troopers are exercised frequently in changing from both reins to the snaffle reins and the reverse.

To shorten the reins, seize the rein or reins to be

shortened between the thumb and first finger of the right hand above the left thumb. To lengthen the reins, seize the rein or reins to be lengthened between the thumb and forefinger of the right hand below the left hand.

In executing these movements, the hands should be displaced as little as possible.

USE AND EFFECT OF THE BIT AND SNAFFLE

483. The effects of the bit reins are similar to those of the snaffle, but more pronounced, even when they are produced by lighter action of the hands.

The bit acts on the bars and gains in power from the leverage afforded by the curb chain, while the snaffle acts directly on the angle of the lips.

484. To demonstrate these effects to the troopers, the instructor causes them first to take the snaffle reins alone and execute thus several simple movements. He then causes them to take the bit reins alone and execute the same movements. He points out the difference between the two means of control.

The instructor then causes the trooper to take the bit reins alone in the left hand and terminates this instruction by the employment of the four reins in one hand.

485. The principal effects of the bit reins are produced by carrying the hand forward, to the rear, to the right or to the left.

If the hand is carried forward, the action of the reins decreases until it disappears; this movement of the hand is limited to the amount necessary to avoid opposition to the forward movement of the horse.

If the hand is carried to the rear, the two reins are stretched equally (direct rein); the impression

received by the bars of the horse's mouth produces a decrease in pace or gait, or even a movement to the rear.

If the hand is carried to the right, the right rein becomes slack and no longer produces any effect; the left rein becomes taut, and presses the neck to the right; the horse is thus caused to turn to the right (bearing rein).

If the hand is carried to the left, the opposite effect is produced.

The effect of the bearing rein produced by one hand may not suffice to cause a change of direction. The trooper should then separate the reins and make use of the open rein.

By using alternately the bit and snaffle, the trooper saves the mouth of a horse that bores, the alternate action permitting the trooper to change from pressure on the bars to pressure on the lips and conversely.

486. In all movements the trooper keeps the arm bent and softens the effect produced by the hand by keeping supple the joints of the fingers, wrist, shoulder, and elbow.

EMPLOYMENT OF THE SPUR

487. The spur is an aid which augments the effect produced by the leg.

The trooper employs it in rear of and near the girth by touching the horse with it, once or oftener, according to his sensitiveness and degree of submission.

COLLECTIVE INSTRUCTION

488. After the recruit has mastered his duties in the school of the trooper, he is ready for collective instruction including the schools of the squad, platoon and the troop, both mounted and dismounted. In general, this instruction includes

close and extended order, scouts, patrols, fighting on foot, employment of the squad and platoon, the advance, fire attack, the troop in support and acting alone, fire, including fire direction, fire control and fire discipline, and finally the employment of the troop.

In collective training the will of the individual trooper is subordinated to that of his squad, platoon and troop leaders. He must thoroughly learn his place and duties in the concerted action of his unit.

The technique of his individual part in the teamwork of his unit and organization must become second nature and his obedience to commands must become automatic.

In no arm of the service is leadership on the part of the officers and noncommissioned officers more essential than in the cavalry. In conducting the various forms of drill, every effort must be made to develop leadership on the part of both officers and noncommissioned officers. Intelligent privates must be given opportunities to drill and lead the squad, squad leaders the platoon, and platoon leaders the troop.

The time which should be apportioned to each item of collective instruction must vary with the circumstances. Ample time must be allotted to the school of the troop.

During the time devoted to the instruction of the larger units, commanders of the smaller units must take advantage of all opportunities to continue the instruction of their commands.

The training of regiments in brigades, and of brigades in divisions, with the proper complement of horse artillery and auxiliary troops, is important, both to insure cooperation and to give practice to the higher leaders and their staffs.

(For details of drill, see latest Cavalry Drill Regulations.)

MANUAL OF THE PISTOL

489. Instruction under this head is first given on foot.

The recruit is first made familiar with the mechanism of the pistol, the names of the principal parts, and the method of cleaning, assembling, and operating it.

When a lanyard is used, the snaps are attached to the butt of the pistol and the magazine; the sliding loop is passed over the head and drawn snug against the right armpit. The lanyard should then be of just such length that the arm can be extended without constraint.

490. The pistol being in the holster, to raise pistol:

1. **Raise,** 2. **PISTOL.**

At the command **Raise,** unbutton the flap of the holster with the right hand and grasp the stock back of hand outward.

At the command **Pistol,** draw the pistol from the holster, reverse it, muzzle up, the hand holding the stock with the thumb and last three fingers; forefinger outside of the guard; barrel to the rear and inclined to the front at an angle of about 30°; hand as high as the neck and 6 inches in front of the point of the right shoulder. **This is the position of raise pistol.** When dismounted, with intervals, carry the right foot about 24 inches to the right and place the left hand in the position of the bridle hand.

491. 1. **Inspection,** 2. **PISTOL.**

Execute **raise pistol** if not in that position. Lower the pistol under the left hand, retaining the grasp of the right hand; pistol pointing to the left front and downward; with the left hand, back up, pull back the slide until the slide stop is engaged, and resume **raise pistol.** If there be no

magazine in the pistol, it will be necessary to engage the slide stop with the right thumb.

If dismounted, the left hand is raised to the position of the bridle hand while manipulating the mechanism.

492. 1. **Return,** 2. **PISTOL.**

Being at **raise pistol,** lower the pistol and raise the flap of the holster with the right thumb; insert the pistol in the holster and push it down; button the flap with the right hand. If the pistol be loaded, and not at "safe," **engage the safety lock with the right thumb** at the command **Return.**

Being at **inspection pistol,** lower the pistol as in executing **inspection pistol** and with the left thumb release the magazine catch (slightly disengage the empty magazine) and the slide stop (to release the slide); engage the magazine, lower the hammer gently, and return the pistol as previously explained.

493. LOAD.

Being at **raise pistol** lower the pistol as in executing **inspection pistol** and release the magazine catch; pass the pistol into the left hand, back down, and with the right hand remove the empty magazine and insert a loaded one; pass the pistol into the right hand; draw back the slide and release it to insert a cartridge into the chamber; engage the safety lock and resume **raise pistol.**

If it be desired to insert a loaded magazine but not to load the pistol, the command is **INSERT MAGAZINE.** Executed as prescribed for **load** except that slide is not drawn back.

The recruits are first taught the motions of loading and firing without using cartridges. Loading and pointing practice should be given mounted at all gaits.

No cartridges will be used, except when indi-

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cated in the first command, thus: 1. **With ball cartridges,** 2. **LOAD.**

494. UNLOAD.

Executed as in **load.** The magazine is slightly disengaged and the slide drawn back in order to eject the cartridge from the chamber; the magazine again engaged, and **raise pistol** resumed.

495. WITHDRAW MAGAZINE.

Executed as in **load,** except that no magazine is inserted, and the slide is not drawn back.

496. Before dismissing the squad, pistols will be unloaded and magazines withdrawn, in order to prevent loaded or partially loaded magazines being left in the pistol.

FIRINGS

497. Being at **raise pistol—**

1, **At (such object),** 2. **FIRE.**

At the first command, push down the safety lock, or cock the pistol and direct the eyes toward the object, turning the head and shoulders in that direction.

At the command **fire,** thrust and point the pistol at the object, arm nearly or quite extended, keeping the eyes on the object, and fire; resume the **raise pistol.**

To fire again at the same object. 1. **Squad,** 2. **FIRE.**

498. The pistol being in the holster—

1. **At (such object),** 2. **FIRE.**

At the first command, direct the eyes and turn the head and shoulders toward the object.

At the command **fire,** quickly draw the pistol from the holster, point it at the object, push down the safety lock, and fire.

499. An almost imperceptible pause may be allowed between the thrusting and firing in which to correctly point the pistol. Deliberate aiming,

however, should not be encouraged. After firing without cartridges, pause an instant to see if the pistol is correctly pointed, to get the personal error.

The instructor must take into account individual peculiarities in order to secure the best results in firing; in such cases departure from the text is permissible.

When mounted, lean slightly forward, bearing on the stirrups; in firing to the front, lean well to the right and slightly forward, to avoid burning or frightening the horse.

TO FIRE AT WILL

500. 1. **Fire at Will,** 2. **At (such object),** 3. **COMMENCE FIRING,** 4. **CEASE FIRING.**

The trooper fires as rapidly as is consistent with careful pointing at each shot.

At the command **cease firing,** the firing will stop, and the men resume the **raise pistol.**

501. Firing practice will be conducted on the principles explained in the Small-Arms Firing Manual.

MANUAL OF THE PISTOL, MOUNTED

502. Raise pistol, return pistol, and **inspection pistol** are executed as when dismounted. The pistol, when carried out of the holster mounted is kept at the position of **raise pistol.**

Load, unload, and **withdraw magazine** are executed as when dismounted, care being taken in handling the pistol with the left hand not to release the hold on the reins and to disturb the position of the hand as little as possible.

In manipulating the slide the muzzle is pointed downward and to the left front to avoid injury to man or horse in case of accidental discharge.

MANUAL OF THE RIFLE, MOUNTED

503. Before standing to horse the trooper attaches his rifle to his belt by passing the muzzle up through the belt ring and engaging the snap hook of the belt ring into the trigger guard.

Being at stand to horse, upon any preparatory command, except for mounting or securing horses, unsling the rifle from the belt ring and take the position of order arms, removing the snaffle reins from the horse's neck and passing the right arm through them, if necessary.

If a command to secure horses is given, link or couple first, and then unsling the rifle.

To mount, proceed as without rifle. When seated in the saddle grasp the rifle at the bolt with the left hand, barrel to the front, place the butt of the rifle in the bucket, steadying the latter with the left foot, if necessary, and take the position of the trooper, mounted.

To dismount: At the preparatory command seize the rifle at the bolt with the left hand, give it a quick, forcible pull, lifting the butt from the bucket, and let the rifle hang from the belt.

MANUAL OF THE SABER

504. For this instruction, dismounted, the saber in the scabbard is carried in the left hand.

In the position of attention the saber will be held upright by the side, guard to the front, the shoe of the scabbard resting on the ground close to the left foot and just in front of the heel. The left arm will be extended, the fingers and thumb grasping the scabbard, back of the hand outward.

In the necessary movements on foot with the saber in hand the saber is carried with the hilt to the front and higher than the shoe of the scabbard. A hook is provided on the belt on

which the saber may be carried when the left hand is otherwise occupied, as when carrying equipments.

Officers dismounted, may carry the saber in the hollow of the left arm, elbow bent, forearm horizontal, guard of the saber to the front, blade vertical.

505. The instructor will impress upon the recruit from the first that he is provided with a saber for the sole purpose of enabling him to kill with it in war, when he will invariably use it

mounted, and that instruction on foot is little more than a necessary preliminary to the training which he will receive later on in mounted fighting.

506. If the squad is in ranks the instructor causes the ranks to be opened and intervals to be taken before drawing saber.

507. 1. Draw, 2. SABER.

At the command **draw,** grasp the scabbard with the left hand about 4 inches from the mouth, place the left hand against the thigh, and carry the hilt to the front; turn the head slightly to the left without deranging the position, and glance at the

saber knot; engage the right wrist in the saber knot and give it two turns inward to secure it; grasp the hilt with the right hand and draw the saber about 6 inches from the scabbard, and look to the front.

At the command **saber,** draw the saber quickly, raising the arm to the front and upward to its full length, saber in prolongation of the arm. Make a short pause with the saber raised, then bring it down with the blade against the hollow of the right shoulder, guard to the front, right hand at the hip, the third and fourth fingers on the back of the grip and the elbow back.

The left hand holds the scabbard as at attention.

This is the position of carry saber dismounted.

508. 1. **Return,** 2. **SABER.**

At the command **return,** grasp the scabbard as in **draw saber** and carry the opening to the front. Carry the saber to the front with arm half extended until the thumb is about 6 inches in front of the chin, the blade vertical, guard to the left, the thumb extended along the side of the grip, the little finger joined with the others.

At the command **saber,** move the wrist to opposite the left shoulder, lower the blade and pass it across and along the left arm, point to the rear. Turn the head to the left, fixing the eyes upon the opening of the scabbard; raise the right hand and insert the blade in the scabbard and push it home.

Disengage the wrist from the saber knot and resume the position of attention.

509. Being at the position of **carry saber.**—

1. **Present,** 2. **SABER.**

Without changing the position of the left hand, execute at the command **saber** what is prescribed in paragraph 508 at the command **return,** except that the grip is held in the full grasp. The saber is said to be held in the full grasp when all four

fingers grasp the grip, the thumb extending along the back in the groove, the fingers pressing the back of the grip against the heel of the hand.

Officers at the command 1. **Present,** execute present saber as described above; at the command 2. **SABER,** lower the saber until the point is 12 inches from the ground and directed to the front, guard to the left, right arm straight, hand beside the thigh. **Mounted** the point is lowered to the level of the stirrup.

510. Being at the **carry saber** —

1. **Port,** 2. **SABER.**

Carry the right foot about 24 inches to the right, bring the left hand to the position of the

bridle hand and raise the saber to a vertical position, guard to the front, grip held in the full grasp, right hand about 12 inches in front of the shoulder.

To resume the carry: 1. **Carry,** 2. **SABER.**

Being at carry saber, or in any position: **GUARD.**

Carry the right foot about 24 inches to the right and bend the knees to simulate the position mounted. Incline the body to the front from the waist (not the hips). Let the blade fall to the front to a position nearly horizontal, elbow well away from the body, forearm and saber forming one straight line, guard to the right, point at the

height of the adversary's breast, the left hand in the position of the bridle hand.

511. Being at the **carry saber**—

1. **Inspection,** 2. **SABER.**

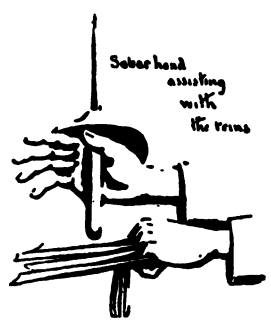
Carry the right hand upward, arm half extended until the thumb is at the height of the chin, grip held in the full grasp, blade vertical, guard to the left. Make a slight pause, then loosen the grasp on the grip and turn the saber with the guard to the left. Again make a slight pause, then resume the first position and return to the carry.

512. Saber exercise is conducted and instruction given as prescribed in the "Saber Exercise."

MANUAL OF THE SABER, MOUNTED

513. The saber suspended from the **left** side of the saddle—

1. **Draw,** 2. **SABER.** Pass the right hand over the reins and execute with it rapidly what is prescribed for drawing the saber on foot; place the pommel near the hip and resting on top of the thigh, flat of the blade against the point of the shoulder. This is the position of **carry saber,** mounted.



514. The saber suspended from the **right** side of the saddle—

1. **Draw.** Turn the head to the right without deranging the position of the body and glance

Rear rank
Charging position
in close order.

Guard - Charging as and

Position Foragers in Melee

toward the hilt, engage the right wrist in the saber knot, pull the hilt forward, seize the grip in the full hand, nails to the right, draw the blade 6 inches from the scabbard, and look to the front.

2. **SABER.** Draw the saber as prescribed on foot and take the position of carry saber.

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515. The troopers are also exercised in drawing the saber as quickly as possible at the single command: **DRAW SABER.**

TO RETURN SABER

516. The scabbard suspended from the **left** side of the saddle—

1. **Return.** Execute as prescribed on **foot.**
2. **SABER.** Exercise as prescribed on foot, supporting the back of the blade against the left forearm until the point is engaged in the scabbard.

This command is given only at a halt or when marching at a walk.

517. The scabbard suspended on the **right**—

1. **Return.** Execute as prescribed on foot.
2. **SABER.** Carry the wrist opposite the right shoulder, lower the blade to the right of the horse's neck, let the grip turn in the hand so that the hand grasps the guard at the pommel, back of the hand up, turn the head to right and fix the eyes on the opening of the scabbard, raise the hand, insert the blade and push it home, disengage the wrist from the saber knot, and turn the head to the front.

When the saber is carried on the right the return saber is executed, so far as possible, at the halt.

518. 1. **Inspection,** 2. **SABER.** 1. **Present,** 2. **SABER.**

Executed as when dismounted.

519. GUARD. Thrust the feet home in the stirrups and crouch slightly in the saddle, bending forward from the waist. Otherwise as explained dismounted.

520. In the charge in close order the trooper in the front rank assumes the position of "charge," the body almost in a horizontal line over the horse's neck, the arm fully extended to the front,

the saber, in the full grasp, in prolongation of the arm, guard up, finger nails to the right, point at the height of the eye. When difficult ground is encountered the trooper takes the position of guard while passing it.

In charging in double rank those troopers who are in the rear rank or who are directly in rear of others take the position of port saber.

In the mêlée the troopers take the position of

Front Rank
Charging Position in Close Order

guard toward the nearest enemy, crouching slightly in the saddle and alive to all possible attacks.

Mounted Combat

(See also F. S. R., "Combat")

(a) against cavalry

521. In the mounted charge of one cavalry force against another, the one attacking with the greater determination and entering the collision with the more violent impetus, combining velocity and cohesion, will be successful.

Officers and men must have a firm resolve to crush the enemy's lines by riding down whatever confronts them.

522. Good cavalry must be able to charge repeatedly. It should be taught to rally quickly behind its leader in response to trumpet call or command.

It is only when the horses are thoroughly trained and hardened and kept in fresh and vigorous condition that cavalry can satisfy all the demands of mounted combat. To arrive at the charging point with horses in distressed, blown, and unsteady condition would be to sacrifice the most important elements of success—vigor and cohesion in the shock.

523. It is the duty of the commander to cause the movements of his units to culminate in a charge against the enemy's main body in a favorable direction and at the right moment. His plan should be definite and simple, his orders brief and precise.

524. There is no normal attack formation and definite rules cannot be laid down. It is the duty of the commander, bearing in mind the general principles here enunciated, to utilize his troops in the manner deemed necessary for the achievement of victory.

525. However, a preliminary articulation of the command provides an **attacking line,** consisting of about two-thirds of the entire force, and a **reserve.**

The commander of each of the large combat groups of the attacking line adopts a formation suitable to his place and duty in the general line and conforming to the nature of the ground. He executes the attack by the simplest and most direct means, with due regard to the position of the adjoining units. He sends out the necessary ground scouts and combat patrols on his own initiative.

526. Only such forces are deployed for the charge as appear to be sufficient to accomplish the

object. These are followed at short distances by units in column or line of columns forming the support.

527. The support by its proximity increases the confidence of the charging line and is in position to furnish immediate assistance, and thus insure the success of the attack.

528. The greater part of the support is disposed in echelon to the attacking line on the unsupported or more exposed flank, prepared to meet enveloping or flank attacks of the enemy. For the latter purpose its units are generally formed in an echelon of columns, as the elasticity of this formation, while favoring facility of advance, permits quick formation for a charge in any direction.

529. The remaining squadrons of the support follow as an echelon to the less exposed flank, or in rear of the line.

The action of the support is directed principally against the intact units of the enemy, such as have not been broken by the charge of the attacking line or remain in support. As a rule, the greater part of the support does not mingle in the mêlée as long as intact bodies of the enemy are in the vicinity.

530. Immediate deployment while advancing against the enemy has an inspiriting effect on the troops. On the other hand, deployment without gaining ground to the front is more quickly made, and may therefore be resorted to when it is desired to make the initial attack with large deployed forces instead of with the leading units only. Such deployment also is useful when space is limited, for example, behind cover, when the plan is to emerge therefrom in deployed lines to surprise the enemy.

531. If the attacking line is forced to cross a fire-swept zone the formation of its units should

be modified so as to diminish the effect of the enemy's fire. Use may be made of cover, but upon approaching the enemy the troops must be in proper place and formation for rapid deployment; it is specially important to maintain the necessary intervals for this purpose.

532. While the flank attack is favorable, the flanks of the attack require protection against similar action by the enemy. The best flank protection is afforded by impassable obstacles. Stone walls, thick hedges, and wire fences should be skillfully utilized for similar purposes. Artillery and machine-gun fire sweeping large open spaces on the flanks afford efficient protection. In the general case the flanks are protected by echelons placed to the rear and outward.

A body of troops placed in echelon in advance of the main line forms an offensive flank, corresponding to the "flank attack" of the squadron and regiment. When the enemy is deficient in maneuvering capacity, or when he can be surprised by the advance echelon emerging from cover, the offensive flank, if skillfully led, promises decided advantages; for if the enemy changes direction to protect his menaced flank he exposes himself to a flank attack by the main line. In open country, however, a competent enemy will take effective countermeasures, so that an offensive flank may find itself flanked in turn and thrown back in disorder on its own troops, separated from its main body, or enfiladed by fire.

A lateral displacement of the main body behind cover may be used to deceive the enemy as to the direction in which the principal attack is to be made.

533. If the enemy does not meet the attack, but retreats when collision is imminent, a part of the attacking line pursues at once to keep him going and inflict as much loss as possible; the re-

mainder, kept well in hand, follows closely to assist in the enemy's destruction and to protect the pursuing troops against reverses.

534. When the enemy receives the shock a mêlée will result. With approximately equal numbers, determination, horsemanship, and skillful use of weapons decide the issue in such a contest.

Such units as have penetrated the enemy's line will rally with the utmost promptness and charging back attack the nearest forces of the enemy still intact or being rallied.

In the pursuit after a mêlée the troops disorganized by success are at the mercy of fresh hostile bodies. They must therefore be followed closely by supports or rallied units.

535. Should the attack fail, the troops withdraw with the object of rallying at the first available opportunity. Artillery, machine-gun, or rifle fire from favorable positions will check the enemy. During the withdrawal officers must endeavor to retain or regain control of their units, so as to be able to take advantage of favorable opportunities for counterattack.

536. The **reserve** formed in line of columns or echelon of columns, follows several hundred yards from the support, in rear of the weaker flank, or in the position assigned to it. The commander in chief, while observing the vicissitudes of the combat, resists the tendency to participate in the various mêlées, and uses the bulk of his reserve as a unit, at a well-chosen time and place, to cause the final disruption of the enemy's dispositions.

537. Should the attack be successful, the reserve assists the pursuit, sending its last fresh troops into action as soon as rallied bodies become available to form a new reserve. In case of failure, the reserve forms a nucleus for the rally, and seeks to reestablish the combat or protect the retreat.

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(b) AGAINST INFANTRY

538. In the mounted charge against infantry the form of attack, as well as the prospect of success, is influenced by a number of circumstances which may cause the problem to vary from the most difficult that can confront the cavalry leader to a mere round-up of dispirited fugitives.

539. The conditions of the ground are unfavorable when the enemy's position is surrounded by open spaces of extensive depth affording neither shelter from fire nor cover from view; also when soft soil or broken ground, dense vegetation or artificial obstacles delay the charging troops or break up their formations.

Rolling country, on the other hand, generally affords good opportunities for a protected approach and for surprise, especially if some cover is available.

540. The character of the enemy's troops should always be taken into account. An attack which, if made against well-trained and highly disciplined infantry would be doomed to failure, might achieve a brilliant success if delivered against troops only partly trained and deficient in experience, or demoralized by previous defeats.

541. The state of a campaign and the progress of a battle also have an important bearing on the vulnerability of troops. When the contest with the opposing infantry has lasted for days, when severe losses have been suffered, when food and water are lacking, or when the vitality of the foot soldiers has been undermined by the climate or by an epidemic, the remnant of their fortitude may be swept away by a vigorous charge of horsemen, turning extreme fatigue and approaching exhaustion into utter demoralization.

542. Conditions for the mounted charge against infantry are considered most favorable when the infantry have exhausted their ammunition, when they are retreating in disorder and beyond control by their officers, or when they have been severely shaken by artillery or infantry fire.

543. The mounted charge may also be useful in covering a retreat, and may be necessary to cut through surrounding forces of hostile infantry.

544. The formation of the charging troops, if substantial results are to be achieved, must always have considerable extension in depth; the lateral extension should be sufficient to leave no part of the hostile force free from attack.

545. Against unshaken infantry a decided success can be obtained only when it is possible to get near to the enemy without being discovered and to attack by surprise. It is then more important to utilize the favorable moment at once, than to attack in perfect formation a little later.

546. Should cavalry be ordered to relieve the pressure against its own infantry or artillery by immediate mounted action, it may be forced to make the attack without the advantage of surprise. In such cases the gallop will probably have to be taken up at greater distance in order to reduce the time of exposure to fire. The commanders concerned should be informed of the intention to attacks so that they may make good use of the respite afforded by the sacrifices of the cavalry.

547. The extent to which the enemy's action is diverted by the danger of the cavalry attack and the number of countermeasures he is induced to take will indicate the degree of relief afforded to the other arms.

548. Against badly shaken and disordered infantry the mounted charge should achieve great successes. In such cases it is of decisive impor-

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tance to attack at the right moment, without delaying to adopt a better formation or to seek a more favorable direction. Effective fire of pursuit of our own infantry or artillery should not be masked by the cavalry charge.

549. The fire of dismounted cavalry is assumed to be equivalent to that of a numerically equal force of infantry. On account of the led horses dismounted cavalry is very sensitive in regard to its flanks and will therefore seek to take advantage of natural or artificial obstacles for protection. In the attack on dismounted cavalry the location of the enemy's led horses should therefore be ascertained as soon as possible and the attempt made to capture them after defeating and driving off the mounted reserve.

(c) AGAINST ARTILLERY

550. The conditions for an attack on artillery are favorable: When it can be surprised, caught in motion or ready to move, or while in the act of limbering or unlimbering; and when it is without support, or when its infantry supports have exhausted their ammunition.

551. With an open field of fire, artillery in position is very strong in front; it is weak in the flanks—less so in rear. Whenever possible, therefore, the attack should be delivered against a flank.

When undulating ground is available for the approach, when the guns are behind cover and can use indirect fire only, and when the supply of ammunition is low, artillery can be charged in front without too serious loss, by advancing at rapid gaits and in open formations.

In an attack on batteries placed in an isolated position or on a flank it will generally be advantageous to make a secondary frontal attack, or at

least a demonstration with lines of foragers, to draw the enemy's fire and divert his attention from the main attack against a flank.

552. In a cavalry battle, when the commander deems it necessary to divert the enemy's artillery fire from his main body and thinks the batteries can be reached, he will designate one or more squadrons for this purpose; they will charge as foragers in the quickest and most direct way.

553. When the enemy's artillery forms part of the general line of battle, it will usually be impossible to charge it in flank. The formation for attack should then be in a succession of lines separated by distances exceeding the depth of a shrapnel burst (200 yards). The first line or first two lines will be deployed as foragers; succeeding lines will be in single rank as supports. These are followed by a reserve in line or echelon of columns. One object of the formation in depth is to prevent the hostile artillery from embracing the entire attacking force with one elevation of fire.

554. The foragers attack the cannoneers and teams; the supports charge the enemy's supports and secure the battery. The reserve follows and is held in hand to meet hostile cavalry or other troops that may attempt to recover the guns.

555. The attack on artillery should usually be made on broad fronts, not only covering the batteries and extending beyond their flanks, but engaging adjoining troops so as to prevent a converging fire on the charging lines. Under modern conditions the advance will be started at such long distance that it will be impossible to recognize and point out separate objects in the defender's line; and, once under serious fire, it is too late to give instructions and effect changes of direction. The rapid advance and charge are

therefore usually made straight at the enemy's position; the gaits must be controlled so as not to exhaust the horses in arriving at the objective. The reserve must close up as the crisis approaches in order to meet eventualities and take advantage of opportunities.

Dismounted Combat

(See also F. S. R., "Combat")

556. Dismounted action, offensive or defensive, is resorted to whenever the tactical situation or the nature of the terrain prevents the cavalry from accomplishing its assigned mission by mounted combat.

The Pursuit

557. After a successful battle relentless pursuit is imperative in order to gather the fruits of victory. It should be continued with the utmost energy until complete disintegration of the enemy's forces is accomplished.

558. The pursuit is the special duty of the cavalry. The vigor and persistence of its efforts will depend to a large extent upon the condition of the horse, a fact to be remembered by army and cavalry commanders during the earlier stages of the action.

559. As a general engagement approaches conclusion, all bodies of cavalry, large and small—including divisional cavalry—hasten toward the front so as to be immediately available for prospective duties. After a victory the mass of the army can dispense with the services of the cavalry temporarily.

560. When the ground is so difficult that large bodies of cavalry cannot pursue as a whole, the division commanders will indicate the general

direction of advance and leave it to brigade and regimental commanders to gain contact with the enemy. On such occasions the rule is to attack whenever possible, and it is better to charge in small units than to do nothing. The constant effort of all commanders of cavalry must be to remain at the enemy's heels and keep him moving.

561. The direct pursuit is initiated by the troops engaged in the battle. As the enemy begins to give way the cavalry masses available near the flanks of the army will advance in lines parallel to the direction of retreat. Their endeavor will be to pass the enemy's masses or retreating columns, to fire into or charge them in flank again and again, to force them off their lines of retreat, to anticipate them at defiles and bar their progress, to destroy bridges, to break up their trains—in short, to attack whenever a condition of disorder offers a chance of success. By taking up a position across the enemy's line of retreat, the cavalry, if in sufficient force, may bring the enemy to a halt and thus gain time for the pursuing infantry to come within striking distance.

Saber Exercises

562. For military purposes the nomenclature of the saber is as follows: **Blade** and **hilt.**

The blade is divided into the forte, the 18 inches nearest the hilt; and the point, the rest of the blade. The saber, model 1913, is two-edged. All the front edge, and half the back edge, is sharp, so that it may be more easily withdrawn from a body, and also, on rare occasions, used to cut. Throughout the text the word **edge** when used alone will mean front edge.

The hilt is divided into the **guard,** which protects the hand; the **grip,** which the hand holds;

and the **pommel**, the lower end of the grip, used to strike with in close fight.

563. The saber is solely a weapon of offense and is used in conjunction with the other offensive weapon, the horse. In all the training, the idea of speed must be conserved. No direct parries are taught, because at the completion of a parry the enemy is already beyond reach of an attack. The surest parry is a disabled opponent.

In the charge and in the mêlée, the trooper must remember that on the speed of his horse in attack, and on his own offensive spirit, rest nine-tenths of his chances of success.

564. Instruction is divided into: **Instruction on foot,** and **Instruction mounted.**

Instruction on foot teaches the mechanism of the use of the saber without embarrassing the trooper with the control of a horse. Its chief purpose is to increase the reach, teach accuracy and quickness, and above all, to make the **thrust instinctive.**

General Plan for Dismounted Instruction

565. (a) The normal guard; the other guards (four). Practice in assuming the various guards.

(b) The five points (thrusts). Practice in pointing.

(c) Thrusts of precision against instructor.

(d) Increase of distance so as to cause the trooper to take the lunge naturally.

(e) The lunge at the right moment.

(f) Exercises to develop the initiative of the trooper.

(g) Replying to attack.

(h) Combat exercises.

(i) Instruction in parrying the lance.

After the trooper, using the exercise saber, has mastered (a) to (d), the last part of the instruction

each day should be with the regulation saber, making points and lunges at command, thus developing the muscles and making the trooper familiar with his weapon.

APPLICATION OF THE GENERAL PLAN FOR DISMOUNTED INSTRUCTION

566. Grasping the saber.—Grasp the grip with all the fingers of the hand, the thumb extended along the back of the grip so as to occupy the lower half of the thumb groove, i.e., the part nearest the pommel. If the thumb occupies the

(a) THE GUARDS

entire groove it will be so near the guard that it may be bruised if the point encounters a strong resistance.

567. The normal guard, or guard to the right front.—At the command **GUARD,** carry the right foot about 24 inches to the right and bend the knees to simulate the position mounted. Incline the body to the front from the waist (not the hips). Let the blade fall to the front to a position near the horizontal, elbow well away from the body, forearm and saber forming one straight line, edge of the blade to the right, point at height of adversary's breast, at the same time placing the left hand, closed, 6 inches in front of the belt buckle to

simulate the position of the bridle hand. **This is the position of guard, dismounted.** It is usually taught from the **carry,** but may be assumed from any position at the command **guard. The other guard positions are taught from the normal guard.**

In all guards, lunges, etc., the left hand should be kept steady and in place so as to form the habit of not jerking the horse's mouth when exercising mounted.

568. 1. **Left front,** 2. **GUARD.** Carry the right hand to the left so that it is above and slightly in

front of the left hand. The saber is held as before except that the wrist is bent slightly to the right so as to decrease the angle between the blade and

the neck of the horse. If the wrist is not bent the blade points too much to the left.

In all movements of the saber from one side to the other raise the saber slightly when passing over the horse's head so as not to scare him. This movement should be insisted on dismounted so as to form the habit.

569. 1. **Right,** 2. **GUARD.** Carry the hand, elbow bent and well away from the body, 90° to the right, forearm and blade nearly horizontal and pointing to the right, point at height of breast of adversary, edge to the rear, finger nails down, head and eyes to the right or in the direction of

the point; at the same time straighten the body on the hips so that, if mounted, the trooper would be sitting erect.

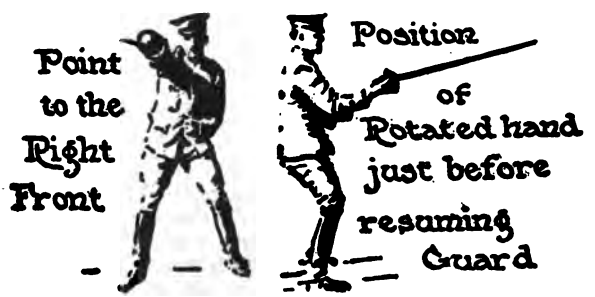
570. 1. **Left,** 2. **GUARD.** Carry the hand in front of the left breast, finger nails down, elbow well away from the body, forearm and blade nearly horizontal and pointing to the left, point at height of breast of adversary, edge to the front, head and eyes in the direction of the point; at the same time straighten the body on the hips so that, if mounted, the trooper would sit erect.

571. 1. **Right rear,** 2. **GUARD.** Carry the hand well to the right rear, finger nails down, blade

pointing downward making an angle of about 45° with the ground, body erect and twisted to the right rear at the waist, head and eyes in the direction of the point.

572. In teaching the guards, as in all subsequent instruction, care must be exercised not to

teach the movements "by the numbers," as it has been in great measure due to this tendency that, with the former regulations, the idea of the saber



as a weapon largely disappeared from the mind of the trooper.

The manual of the saber—that is, the carry, present, etc.—is the only part that should be exact. The guards, lunges, etc., with the saber are to it

what range practice is to the rifle. Results are what count, not useless uniformity at drill. This does not mean that details should be slighted, but it does mean that there should be no idea of cadence.

When the various positions of guard, as taught from the normal guard, have been mastered, they should be taken from any guard, from rest, or from any position whatever at the appropriate command.

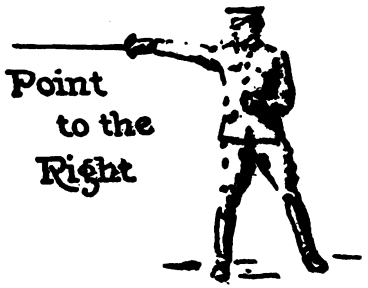
(b) THE POINTS

573. Being on guard: 1. **Right front, 2. POINT.** Without moving the body extend the saber in the

direction in which it is pointing with maximum force and rapidity, rotating the wrist slightly to the left at the same time, so that edge will be up and to the right; resume the guard at once. In drawing back the hand, rotate the wrist to the right until the finger nails are up; when the guard is reached, turn the finger nails down and resume guard as prescribed.

The object of this rotation is to give a more secure hold in withdrawing the saber from a body. It must be insisted upon at all times in points and lunges to the right front and in charge saber.

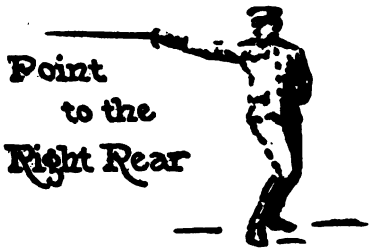
574. Being on guard to the left front: 1. **Left front,** 2. **POINT.** Extend the saber in the direction in which it is pointing with maximum force and rapidity, rotating the hand to the left so that the edge of the blade is up; twist the body slightly to the left at the waist; resume the guard at once. Care must be taken not to move the bridle hand.



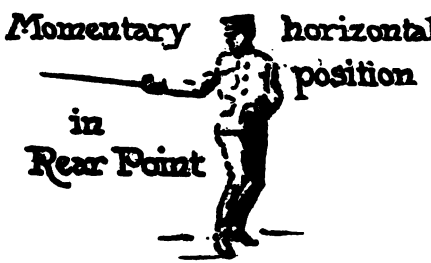
575. Being on guard to the right: 1. **Right,** 2. **POINT.** Without moving the body, extend the saber to the right with maximum force and rapidity; resume the guard at once.

576. Being on guard to the left: 1. **Left,** 2. **POINT.** Extend the saber in the direction in which it is pointing with maximum force and

rapidity, rotating the wrist to the rear so that the edge of the extended blade will be up; twist the body slightly to the left at the waist; resume the guard at once. Do not derange the bridle hand.



577. Being on guard to the right rear: 1. **Right rear,** 2. **POINT.** Raise the hand until the forearm and blade are nearly horizontal; then extend the arm to the right rear with maximum force and rapidity, rotating the wrist to the right at the



same time, so that when the full extension is reached the finger nails will be up and the edge of the blade to the right; resume the guard at once. A momentary pause at horizontal position is necessary in order to get the saber in desired direction.

578. The points are explained from their respective guards for simplicity. When they have

been mastered they should be executed from any other guard as well as from the appropriate one; also two or more points should be made at one command. Examples, being in any guard: 1. **Right front and left front**; or, 1. **Right front and right**, or etc., 2. **POINT.** Point in the directions named with the utmost rapidity and then return to the guard from which the movement started. Or, being in any guard: 1. **Right front (left front, or right)**, 2. **Two times**, 3. **POINT.** Point twice in the direction named and resume the guard from which the movement started.

Example of going from one guard to a different point: Being on guard to the left front, 1. **Right front**, 2. **POINT.** Lift the saber so as not to strike the horse's head and execute **right front point**, merely sliding through the normal guard and returning from the extension to the left front guard by the shortest line.

In all the points the eye follows the point.

(c) THRUSTS OF PRECISION

579. The trooper uses an exercise saber. The instructor wearing a plastron and mask, but without a saber, approaches him on his right front and causes him to take the position of guard. The instructor verifies the position accurately and in the same way causes him to take the other four guards.

He next moves around the trooper, causing the latter to follow him with his point, thus passing naturally from one guard to another.

In this and in all succeeding exercises where men oppose each other dismounted, care must be taken that they do not exactly face each other when practicing combat to the front. If mounted this would be impossible as horses will not run into each other head-on if they can avoid it. Hence if "A," facing north, is attacked by "B," to the right

front, "B" will face south, and a zone of indefinite length running from north to south and at least 1 foot wide will separate, at all times, the lines of advance of the right feet of the combatants.

If "A" is attacked by "B" to the right, they would face as above, but the separating zone would be wider and "B" would be opposite "A."

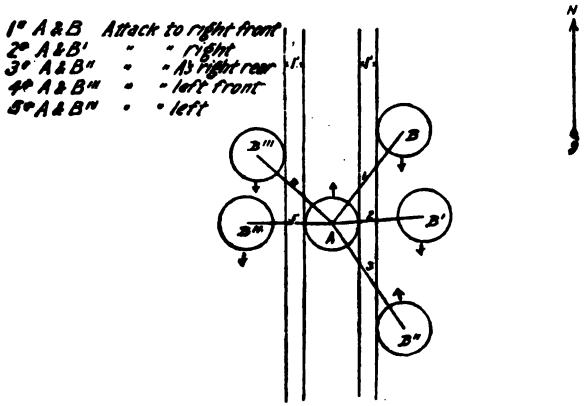


Fig. 1.

Similar conventions must be maintained in attacks from left front and left, and from right rear.

Conditions where men cross each other diagonally will arise in combat and may be practiced mounted; but, dismounted, they cannot be even approximately represented.

Also, in combat troopers should ride down opponents, striking them head-on in the flank, but this cannot be practiced.

When the trooper has gone through all the guards accurately the instructor will begin at the right front, placing himself in the position described and at such a distance that the trooper

may reach him easily. He will indicate with his finger various places on his body, give the command **POINT,** and cause the trooper to point rapidly at them and resume the guard quickly each

time. He will not advance to a new guard until the trooper is accurate in the one he is in.

This same practice should be carried on with the service sabers against a bag of bran or sand fixed at the height of a man's chest, the instructor using a wire circle 3 inches in diameter on the end of a stick to indicate the spot and cause the trooper to point through it.

(d) PRACTICE WITH INCREASED DISTANCE

580. When the trooper is accurate at (c) the instructor directs him to take the position of guard

and to point at him, gradually increasing the distance so that the trooper must lean farther and farther to the front to touch him.

As the trooper extends his arm and body to the utmost he should rotate his hand to the left so that when fully extended the edge of the saber will be up and the finger nails to the right. The blade should be at the height of the eye, the line of sight parallel to the direction of the blade. The body should be bent forward so as to be nearly

horizontal, the trooper making every effort to reach as far to the front as possible.

This is the position of **Lunge** to the right, also the position of **Charge saber.**

581. Being at any guard: 1. **To the right front,** 2. **LUNGE.** The above position is taken, making the extension with maximum force and rapidity and returning to the guard at once.

At the command: 1. **Charge,** 2. **SABER,** the above position is taken and held until changed by

some appropriate command, such as: **Guard, carry saber,** etc. In returning to any guard or other position from the right front lunge or charge saber, the same rotation of the wrist to the right is made as in returning from the right front point.

582. The instructor now causes the extension to the left front to be taken in the same way. When the extension is completed, the blade should be at the height of the eye and parallel to the line of sight, the edge of the blade up and slightly to the left; the body bent well to the left front so as to be nearly horizontal, left shoulder carried forcibly

to the rear so as to be covered by the extended saber. It is taken from any guard at the command: 1. **To the left front,** 2. **LUNGE.**

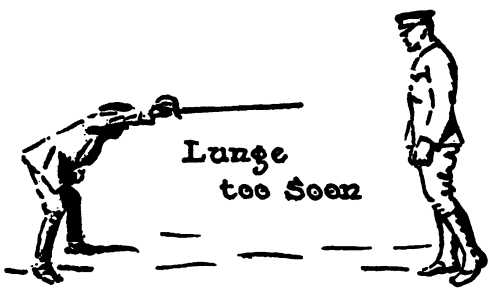
583. The instructor causes the lunges to the right and left to be taken in the same way. These two lunges differ only from the corresponding points in having the foot on the side away from the lunge lifted slightly, so as to give the maximum reach, and the foot on the side of the lunge turned slightly out as would naturally be the case in the same lunge mounted. They are taken from any guard at the command: 1. **To the right (left),** 2. **LUNGE.**

584. The lunge to the right rear cannot be taken gradually on foot. Being at the right rear guard: 1. **To the right rear,** 2. **LUNGE.** Cause the trooper to raise the forearm and blade to the horizontal, as in the right rear point, and then to

extend the saber forcibly to the rear, rotating the hand during the extension, so that at its completion, finger nails will be up and edge to the right (outside); and at the same time keep the eyes to the rear and bend the body vigorously to the rear from the hips. This lunge may be executed from any guard after it is mastered.

(e) THE LUNGE AT THE RIGHT MOMENT

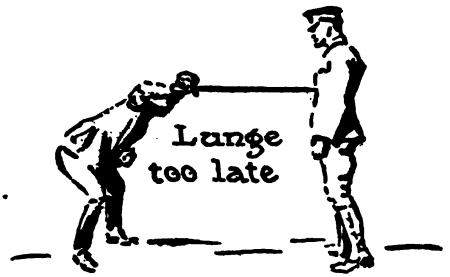
585. In the charge the trooper is merely a projectile, the saber its point. He is a unit in a line rushing on the enemy with the one idea of riding



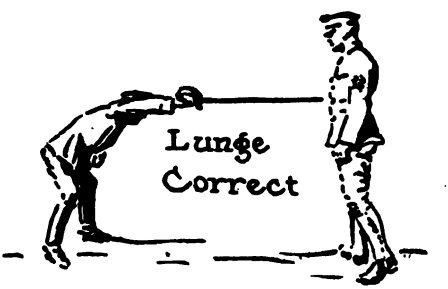
him down and transfixing him with his rigid saber, held at the position of charge saber.

In the mêlée, the trooper still goes at speed, riding down his opponent, but here the ranks are broken, and both he and his opponent have more room. In this case should he maintain the position of charge saber, he would have less control of his horse and might easily be attacked from either flank or from the rear, and he would be helpless except against attack in front. Hence, he takes the position of guard toward his nearest enemy, crouching slightly in his saddle and alive to all possible attacks. In this alert position he gallops

on his adversary and makes a lunge to the right front or left front when he estimates that the point of his saber will reach its full extension about 6



inches before touching the breast of his adversary. If the trooper does this accurately his enemy will have no time to parry and the speed of approach



of the two horses will instantly transfix him. This is called the **thrust at the right moment.**

586. In teaching this the trooper and instructor face each other at the guard to the right (left) front. The instructor causes the trooper to lunge

at him at command: First, too soon, thus losing the advantage of his alert position by lunging at too early a moment; then too late, thus sacrificing his reach and running the danger of letting his adversary beat him to the touch; then at the right moment, so that the saber will reach the extended position when the instructor is still about 6 inches from its point. When the trooper understands what the right moment is, the practice should be continued with the trooper using his own judgment as to when to lunge. This exercise should be practiced to the right front and left front, and much less frequently to the right rear, in the following sequence: Trooper stationary, instructor walking; trooper stationary, instructor at double time; trooper walking, instructor stationary; trooper at double time, instructor stationary; both walking; and both at double time. This exercise is very important.

(f) EXERCISES TO DEVELOP INITIATIVE

587. As the trooper is unaccustomed to the use of the saber, should he fail to touch on his first attempt, he will often stay in the position of lunge staring at his enemy while the latter either sticks him or escapes. To overcome this tendency and to develop initiative, commence as in the exercise of the lunge at the right moment, but have the instructor avoid the first lunge by ducking, swaying his body, or suddenly changing his direction and continuing his course either toward or past the trooper. The latter must immediately resume the guard and instantly lunge or point at his adversary in new directions until he has touched him or until he is out of reach. No matter how often he may have to try, he must come to a guard after each attempt, to assure an accurate aim and sufficient "punch" to stick his opponent. In this case

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the necessity of the lunges to the right and left becomes apparent.

These exercises are important and should be practiced in the same sequence as under (e).

(g) REPLYING TO ATTACK

588. Up to this point the instructor has not carried a saber. In order to give the trooper confidence and to teach him to disregard everything and lunge at the body of his adversary, the instructor now takes a saber and causes the trooper to reply to attacks.

The trooper comes on guard to the right (left) front; the instructor attacks him, making faulty attacks, such as cuts, high points, low points, or inaccurate points. To all of these he causes the trooper to reply with a lunge at the right moment, disregarding the saber of the instructor and fixing his full attention on touching him in the body with his point. Should he in so doing encounter the saber of the instructor, he will, simply by the power of his extension, force it to the outside and go on to the touch.

589. In this exercise two things require special attention.

1st. It is a serious error to seek the blade of the adversary instead of disregarding it and seeking the touch, brushing the blade aside as a secondary consideration should it interfere. There is a strong tendency toward this seeking of the blade among men who have fenced under the old rules. It must be prohibited. On foot, at the walk, it is quite possible to make this sort of a parry and still have time to touch; but, mounted, at a gallop, a man who seeks the blade of his foe and parries it may escape uninjured, but so will the other man. The speed of the horses is such that the enemy will be out of reach before the trooper can make an effective lunge at him, whereas if he disregards

the other's saber and lunges at his body, he will, in so doing, force his adversary's saber aside and transfix him. Moreover, the very idea of seeking the saber so as to parry it is taking a defensive frame of mind and is contrary to offensive cavalry spirit.

2d. The instructor who attacks with the cut must carefully avoid hitting the trooper after he has himself been touched. With the exercise saber the touch with the point is hardly perceptible and would not weaken the instructor's cut. In combat, however, the difference in time between a touch with the point and a cut with the adverse edge will usually be sufficient for the spasmodic contraction caused by the entrance of the point to render the cut ineffective. If the instructor disregards this fact, he will get the trooper to parrying, and spoil him as an offensive swordsman. The same is true if the instructor, taking advantage of his superior skill, continually touches the trooper with the point; he will ruin his confidence. These exercises are to instruct the man, not to glorify the instructor. They should be carried on in the same sequence as the exercises under (e) and (f).

(h) COMBAT EXERCISES

590. In teaching the combat dismounted, every effort must be made to preserve the idea of combat mounted. The troopers must move either on straight lines or large curves; and they must never halt during an attack.

In dismounted work it is not permitted to give any of the exercises of attack or of combat from the position of charge saber, for the charge is an extended position deriving all its great effect from the momentum of the horse. On foot it is impossible to impart this momentum, hence the use of the charging position dismounted would produce incorrect ideas. The position of charge saber

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should be learned accurately on foot; and then, when mounted exercises are begun, the charge assumes its true place and should be practiced as much as all the guard positions combined. This must be carefully noted or else the charge, being less interesting, will be slighted.

591. First Exercise.—Place the trooper on guard. Place around him three assistant instruc-

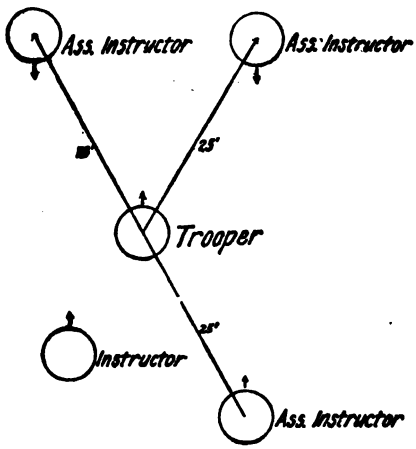

Fig. 2.

tors, one to the right front, one to the left front, and one to the right rear, each at a distance of 25 feet from the trooper (Fig. 2).

The instructor takes his place to the left rear where the trooper cannot see him. He then signals for first one and then another of the assistants to attack the trooper, indicating by a prearranged signal whether they are to use a cut or a thrust.

The trooper replies in all cases with a lunge at the right moment, care being taken that he does

not shorten his extension. As the trooper becomes accustomed to rapid changes of guard the instructor may decrease the intervals between attacks and cause the assistants to attack at double time.

In order to preserve the trooper's confidence, the attacks of the assistants should usually be faulty, especially at first. The attacks must never be so difficult or rapid that the trooper cannot reply to

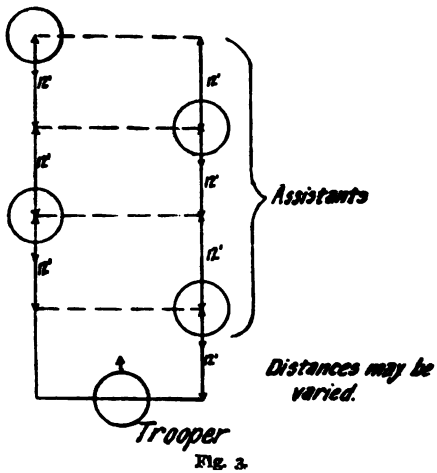

Fig. 2.

them, as this is a situation that could not occur in combat owing to the unruliness of excited horses, and to represent it on foot would destroy the trooper's confidence. The men acting as assistants must either be trained assistants or, if such are not available, trustworthy noncommissioned officers who will enter into the spirit of the exercise.

592. Second Exercise.—Place the trooper on guard. Place two columns of assistants to face

him, the head of one column to his right front, the other to his left front (Fig. 3).

At the command of the instructor the two columns advance on the trooper at the gait indicated (slow walk, fast walk, or double time), keeping their relative positions and attacking the trooper successively with various attacks. These attacks may be prearranged by the instructor at first, and later left to the discretion of the assistants. The trooper in all cases replies to the attacks with lunges at the right moment either to the right or left front. Care must be taken that the assistants do not get out of position so that two attack at once. They must stay as in the diagram so as to attack successively. The same cautions apply to this as to the first exercise. Later the exercise should be conducted in the same sequence as under (e) and (f).

(i) PARRYING THE LANCE

593. In attacking a lancer, rapid approach is even more important than against a swordsman. The only moment of danger is when the point of the lance comes within the first reach of the fully extended saber. If, at that moment, the swordsman lunges, forcing the lance to the outside, he is safe and the lancer is at his mercy. The same is true of the charging position, which is a lunge, but as the effect cannot be seen dismounted, it will be explained mounted.

To teach the swordsman to meet a lancer, place the trooper on guard and have a graduate instructor armed with a dummy lance approach him from the right front. As soon as the point of the lance comes within the utmost limit of his reach the trooper should lunge to the front, forcing the lance to the outside and, letting his saber slide the length of the shaft, aim at the body of the lancer. The same exercise is repeated to the left front. A

lancer has more control of his weapon to the left front, hence whenever possible he should be attacked on his right front. Exercises with the lance should be taught only by graduate instructors trained in its use.

594. There is no guard taught to the left rear, for if a trooper is attacked from that direction his arm is in the position giving the least reach, while his opponent has the longest reach possible. Hence, whenever attacked from the left rear, incline slightly to the left, then circle to the right on a large radius so as to bring the pursuer to the right rear or right. A trooper should occasionally be attacked from the left rear and then always be required to circle as described. He should attack instructors on their left rear so as to fully appreciate the advantages of that position. Against a lancer the case is different. His left rear is a much stronger position for him than his right rear, so he should be attacked on his right rear.

General Plan of Mounted Instruction

595. (a) Without arms, and then with arms, at a halt, require the troopers to take all the positions of guard and to make all the lunges, extending slowly.

(b) Make lunges from various guards at command at the walk, trot, and school gallop. Conduct the exercises near dummies to accustom the horses to them.

(c) Accustom the horses to the sight and sound of sabers.

(d) Pass among dummies with sabers.

(e) Preliminary work against dummies.

(f) Varied work against dummies.

(g) Exercise in pursuit.

(h) Exercises in combat.

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Application of General Plan of Mounted Instruction

596. Being mounted and in any position: **GUARD.** Instantly assume the position of guard as explained in the instruction dismounted, drawing the saber if not already drawn.

Being mounted and in any position: **CHARGE SABER.** Assume and hold the position of lunge to the right front, at the same time taking the gallop straight to the front unless some other gait and direction are indicated. At the command **guard,** resume the normal guard. In returning to the guard from charge saber or from the lunge to the right front, the rotation of the wrist to the right is as described in point to the right front.

When at charge saber and difficult going is encountered, resume the guard, taking charge saber again when the ground permits.

Never jerk the horse's mouth while making any of the movements with the saber.

(a) Exercises without arms; exercises with arms, at a halt

597. The troopers being mounted, without arms, and then with arms, in any suitable extended formation at a halt, cause them to take the various guards they have learned dismounted, using the same commands. The general principles of the dismounted instruction apply.

Guard. Thrust the feet home in the stirrups and crouch slightly in the saddle, bending forward from the waist. The left hand, near the base of the neck, grasps the reins so as to feel the horse's mouth. Otherwise as explained dismounted.

1. **Left front,** 2. **GUARD.** Make the change of guard as described dismounted.

Guard
to the
Right Front.
Guard to the
Right Front

Guard
to the
Left
Front.

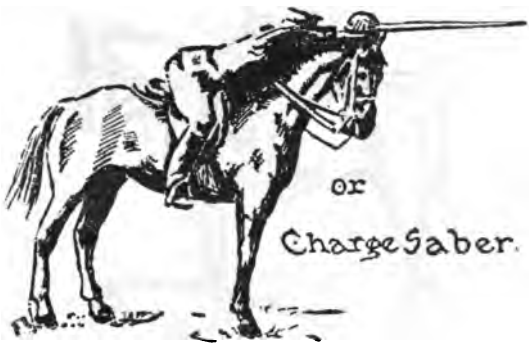
Guard
to the
Left.

Guard
to the
Right.

Guard to the Right Rear

Guard to the Right Rear

Lunge to the Front

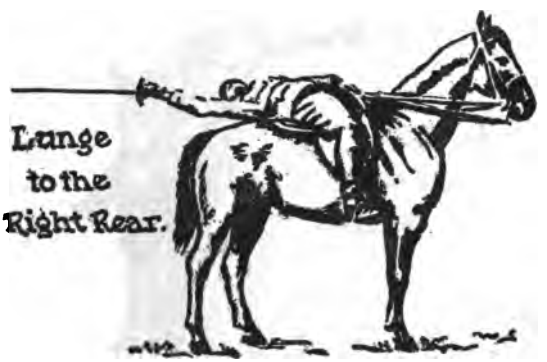


Lunge to the Right Front

Lunge
to the
Left

Lunge
to the
Right.

Right-Low Lunge



1. **Right** (or **Left**), 2. **GUARD.** The toe on the side of the guard naturally turns out a little, otherwise the position is as described dismounted.

1. **Right rear,** 2. **GUARD.** The right hand, nails down, is rested on the cantle near the center, or may be held in the air near this position; otherwise as explained dismounted. This guard will only be taken in cases of emergency. It is always pref-

erable to circle and receive the attacker on the right or right front.

598. The points and lunges are executed as has been explained dismounted. Care must be taken that the legs remain in place and do not fly to the rear. In making the extension in the lunges to the front and in charge saber, the left hand supports part of the weight on the neck of the horse, and the left forearm rests on the horse's left shoulder.

The positions are simple and natural and can be best understood by consulting the figures.

The lunges should be made very slowly at first, so as not to frighten the horses; when the horses have become accustomed to the movements, snap and vigor must be insisted on.

When using the lunge to the rear in combat, the only way for the man in front to reach his pursuer suddenly to attack him, is to check his horse quickly at the moment of making his lunge to the rear.

To do this he closes his legs forcibly behind the girth and increases the pull on the reins, momentarily supporting his weight by them as he lunges and resumes the guard.

At drill, however, the trooper does not make this sudden half-halt, on account of the danger of punishing the horse's mouth, but in executing the lunge to the rear allows the reins to slip through the fingers of the left hand, supporting himself by these fingers on the pommel of the saddle.

(b) GUARDS, POINTS, AND LUNGES AT THE VARIOUS GAITS

599. When lunges are first made on a horse he will frequently swerve from his course or change his gait. These tendencies must be overcome.

Place the troopers in formations such as column of troopers on a circle or on the track with a distance of two horse-lengths between horses. Or, being in column of troopers on the track, as the head of the column crosses the short end of the rectangle, have the leading three or four troopers move by the flank straight down the length of the rectangle, each succeeding three or four to follow the first.

Being in such a formation commence at the walk and cause the troopers to execute guards, points, lunges, and charge saber at command. See that full and accurate extensions are made and that horses do not change gait or direction. Do not increase gait until troopers and horses go well. Combat the tendency to make only partial extensions. Have charge saber held for considerable periods. The work should be carried on in the

vicinity of dummies so that the horses may gradually become used to them.

(c) TO ACCUSTOM THE HORSE TO THE SABER

600. When handling horses that have not become used to the sight of the saber at drill, it is best to use the exercise saber. Let the trooper carry it and execute the movements under (b) at a walk.

Arrange the troopers with intervals in two parallel lines and cause them to advance as if to pass through the intervals, first at guard and later at charge saber. When the troopers are opposite each other, have them halt and raise their sabers, all the while soothing their horses; then resume the guard and continue the march.

When the horses cease being excited, have the troopers strike the flats of their exercise sabers together as they halt opposite each other, and then pass on. Later, strike sabers without halting.

Place the troopers on concentric circles on opposite hands and have them strike the flats of their exercise sabers as they pass.

Finally, lines of troopers with intervals should pass through each other at a gallop, striking their exercise sabers as they pass, exciting the horses as little as possible.

(d) PASSING AMONG DUMMIES

601. Dummies should be movable and not always set up in the same place.

Arrange five or six dummies on a rectangle at varied intervals. Have the instructor on a trained horse lead the column of troopers through the dummies at all gaits. When the horses go fairly well, the troopers should begin thrusting at the dummies and striking their sabers against the supports. Put the nervous horses at the rear of the column.

(e) PRELIMINARY WORK AGAINST DUMMIES

602. Place the dummies in a row with about 10-yard intervals. Have the troopers attack them to the right front in the position of charge saber, at the walk, trot, and school gallop. Insist that the trooper does not flinch, but keeps his full extension until the point has entered the dummy, and then instantly withdraws it and assumes **guard** with

the rotation to the right described in **point to the right front.** When the trooper is proficient, place a second row of dummies 10 yards behind the first and cause the troopers to attack the first row as before and the second from **guard.** In the second attack be sure that they make full lunges at the **right moment** and not too late, as is the usual tendency. After both attacks the guard must be instantly resumed.

There is no trouble in withdrawing the saber from dummies in lunges to the right and left. After charge saber or lunge to the right front, the saber will usually have penetrated deeply. The

trooper in withdrawing it should give a decided pull to the rear as he rotates his wrist to the right. This does not remove the saber, but the movement tightens the muscles of the forearm and prevents the wrist from bending and being hurt. There must be no thought of withdrawing the saber until it has gone well home in the dummy.

After lunge to the left front there is a tendency to let the hand come over the head in withdrawing the saber. This is dangerous, as a slip may cut the face.

As soon as the blade has gone well home force the hand down, keeping the elbow stiff, straighten the body to the guard position, at the same time the back of the hand will come against the body near the belt and the movement of the horse will easily withdraw the saber.

Place a hurdle or low fence so as to form a barrier between the trooper and the dummy and about 5 feet from the dummy. Cause the trooper at guard to pass this on his right hand and lunge to the right as he passes, then turn and taking **guard to the left front,** lunge to the left front as he passes. The only use of the barrier is to keep the troopers from riding too close to the dummy; if this can be done without the barrier, the latter may be omitted.

(f) VARIED WORK AGAINST DUMMIES

603. The preceding exercises should be practiced until the trooper has accuracy and confidence. As the charge is the chief feature of combat, the first dummy should always be attacked from the charge saber. If a trooper gets careless or flinches, he must go back to (e).

The object of the following exercise is to simulate combat, to develop bold riding, and increase confidence. The exercises given below are examples of what may be done; the difficulty must

be proportionate to the ability of the trooper as a horseman.

It must be remembered that in all attacks against a dummy from charge saber, the trooper is supposed to be in the front rank of a line charging in close order. His horse is jammed in the press of horses and can only move to the front. If a horse at drill continually avoids a dummy when his rider is at the charge, he should be put in a chute or in some other way made to move straight to the front. When the dummies are attacked from a guard position the trooper is supposed to be in a mêlée or in a line in extended formation. When attacking from guard to the right front or left front the lunge must always be at the **right moment**; there must be no short

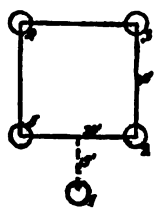


Fig. 4.

lunges or poking. The saber is fully extended in time for the speed of the horse to do the penetrating. In lunges or points to the right or left it is, on the other hand, the power of the man, not the speed of the horse, which causes penetration. Against infantry in line use the charge saber and accentuate the leaning to front. Against broken infantry or men lying down attack from guard.

First Example.—Attack No. 1 at charge saber, then, still keeping the gallop, attack the other four dummies in any suitable order as long as two are attacked to the right or right front and two to the left or left front (Fig. 4).

Second Example.—Attack dummy No. 1 at charge saber, No. 2 with a lunge to the left front, No. 3 with a lunge to the left, No. 4 with a lunge

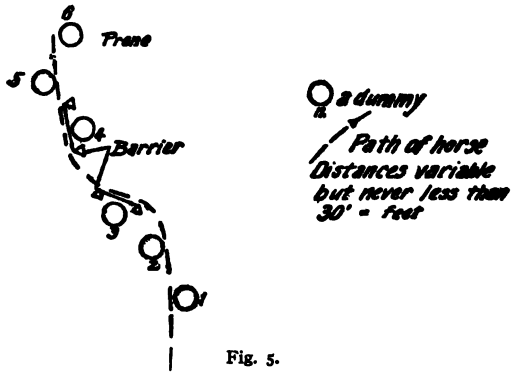


Fig. 5.

to the right, No. 5 with a lunge to the left front, and No. 6 (a prone figure) with a lunge to the right front low (Fig. 5).

Third Example.—Jump the hurdle at the guard, attack dummy No. 1 at charge saber, No. 2 with a lunge to the right; jump the second hurdle at the guard, attacking No. 3 to the left while in the air; take a broad jump, or two hurdles fixed to simulate one, and attack No. 4 to the right front in the air (Fig. 6).

These examples can be practiced either in a hall or on the drill ground. In addition, dummies may be made of sacks filled with straw and either tied to posts or hung from trees and placed on varied ground. Dummies must always be attacked at the gallop and hence not placed where this gait is impossible.

(g) EXERCISE IN PURSUIT

604. This exercise should be carried on in a riding hall, or in some place with clearly marked

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limits, so that the pursued will have to stay within these limits and hence dodge. Besides being an exercise in riding and handling the horse, it is also most excellent in teaching a man to keep his left rear covered.

Example.—Fasten a knot of ribbon or paper to the left shoulder of a trooper. Give him a start of a few yards and then have a second man pursue

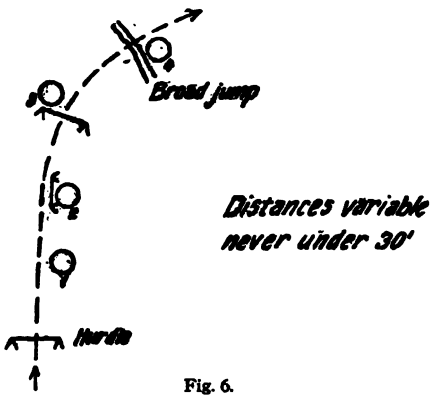


Fig. 6.

him and try to snatch the ribbon. If, at the end of two minutes, the ribbon is still secure, send out a second man and let the two continue the chase for an additional minute. Obstacles should be placed to aid the trooper in dodging, and at the same time practice him in jumping.

(h) EXERCISES IN COMBAT

605. Only troopers who have shown marked proficiency in all the previous exercises, and who in addition have sufficient intelligence and discipline to abide absolutely by the rules, should be allowed to participate in this exercise. And even

with these precautions the exercise has such a tendency to make men slow up and to frighten horses that it should not be frequently indulged in, and never without an officer as judge.

Individual combat.—Place two troopers armed with masks and exercise sabers facing each other at a distance of 50 yards. At a signal they approach each other at the gallop in the position of guard. Each tries to touch. When one touch is made, or at the end of 30 seconds if no touch is made, a signal is given and the bout stopped. If the bout is part of a competition the scoring is as follows:

Plus one for the man making the touch.

Minus one for the man touched.

If both touches occur at the same moment the man who in the opinion of the judge makes the most serious touch is given plus one and the other man minus one.

If in the above case both touches are of equal value each man is given zero.

If no touch is made in the time allowed each is minus one.

When one man clearly runs away and the other is unable to catch him, the man who runs is given minus one, the other zero.

Each organization must enter the same number of contestants; the one with the largest algebraic sum at the end wins. Or the combat can be to determine individual championship, in which case each contestant must fight every other contestant; the one losing the smallest number of bouts wins. If several lose the same number they must fight off the tie.

Combat by groups.—Place two groups of four troopers each in line with 6-yard intervals facing each other 50 yards apart. At a signal the troopers gallop toward each other in the position of guard, each trooper passing to the right of the

one facing him. When the lines have passed the troopers turn about individually and attack any one of the opponents they please. The signal is given and the bout stops when all the members of one group have been touched, or at the end of one minute.

The following rules must be observed:

1. A man who is fairly touched must hold up his saber and gallop from the inclosure.
2. A man must not touch another if he himself is touched.
3. A man striking his own or another horse is counted as touched.
4. A man using the edge is counted as touched.
5. A man going slower than a gallop or who is forced from the inclosure is counted as touched.
6. A man guilty of dangerous riding is counted as touched.
7. The individual combat should be conducted in some sort of marked-off space 50 yards square; the combat by groups in a similar inclosure.

The above seven rules apply to both individual combat and combat by groups.

If the combat by groups is part of a competition the following rules for scoring hold:

That side wins which has the most men left at the end of a minute. It is scored plus one, the losing side minus one.

If each side loses the same number of men, the one first losing them is scored minus one and the other plus one.

If each side loses the same number in the same time, each is given zero.

If a man fails to admit a touch, his side is given minus one.

If neither side loses a man, each is given minus one.

The groups are not allowed to charge each other as, to avoid accidents, they would have to pull up

or charge with intervals; in neither case could the effect of the charge be demonstrated.

CONSTRUCTION OF DUMMIES

606. As nearly all the mounted work with the saber is carried on against dummies it is necessary

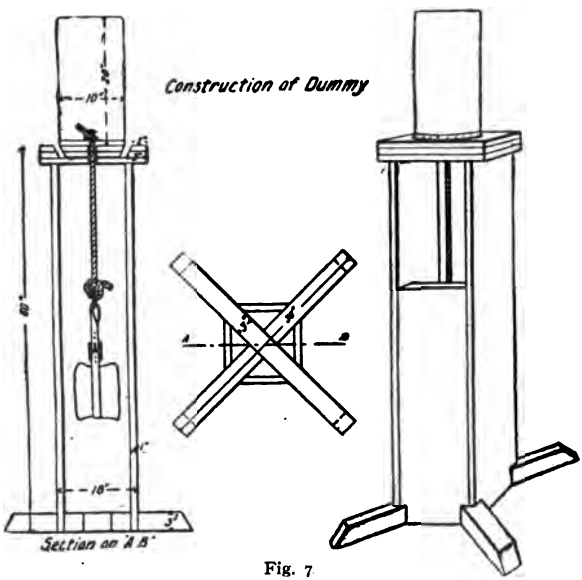


Fig. 7

to have suitable ones. The resistance should approximate that offered by a human body, and the dummy should be constructed so as to give way in about the same manner as a human body in combat, without hurting the trooper or frightening his horse.

A dummy constructed on the following lines seems to answer the purpose. It can be made out

of old material, at small cost, by anyone who can use tools (Fig. 7).

The dummy itself is a cylinder of burlap or sacking 10 inches in diameter and 20 inches long. The upper end may be fastened with a string or sewed. The lower end is tacked to the frustum of a right cone 10 inches in diameter at the upper section and 6 or 7 inches at the lower. The frustum is from 3 to 4 inches thick. The sack or cylinder of burlap is stuffed as tightly as possible with straw. A strip of leather nailed around the bottom of the sack where it joins the wooden base keeps the burlap from tearing out.

The wooden support is made as shown in the diagram. The basin at the top in which the dummy moves is made by cutting holes of suitable diameter in two or three 1-inch boards and nailing them together. The diameter of the basin should be 3 inches greater than that of the base of the dummy.

The weight, a bag of sand, should weigh about 40 pounds. It can be changed to vary the stiffness of the dummy.

The weight should hang low in the support to make more stable.

When the dummy is used outside, iron pins with L-shaped heads may be driven into the ground with the projection over the support to prevent it from being knocked down. In the hall it will occasionally be upset. The supports cannot be made longer or the horses will step on them.

An ordinary sack filled with straw makes a good prone dummy. An old blouse and breeches should be put on it to accustom the horse to go steadily among men.

Rings or other targets which offer no resistance to the saber should not be used. Dummies made by suspending sacks from above are unsatisfactory as they swing up instead of down when struck.

Cavalry

Care of Horses

GENERAL PROVISIONS

607. A most important duty of the cavalry officer is keeping his horses in such training and health as will enable them to do their work to the best advantage. The proper performance of this duty requires careful instruction of the men in the treatment, stabling, management, watering, feeding, grooming, and exercising of the horses, and such continuous supervision and inspection by officers as will insure that instructions are understood and are being carried out.

Cavalry officers should make themselves thoroughly acquainted with the natural history and physiology of the horse, and with the effects of different methods of treatment, changes of diet, etc., upon his system and powers of endurance.

They should have a familiar knowledge of the symptoms and methods of treatment of the diseases that are common to horses, what to do in emergencies, and a good knowledge of the effects of the medicines supplied to the squadron. They should also be practically familiar with the principles of horseshoeing.

Sore backs are, as a rule, the result of carelessness or neglect; the immediate cause may be faulty adjustment of the saddle or equipment or bad riding.

At each halt officers and noncommissioned officers should inspect the adjustment of saddles and equipment of their men and should at no time tolerate lounging in the saddle.

Horses when received in the regiment are assigned to squadrons according to color, under direction of the commanding officer. They are branded on the hoof of one fore foot with the letter of the squadron and the number of the regi-

ment on the same line; as D 7. Their purchase number is found tattooed on the inside of the upper lip.

Captains make permanent assignments of horses; after a horse is so assigned, his rider will not exchange him nor allow him to be used by any other person without permission.

RULES FOR THE CARE OF HORSES

608. All troopers must be taught and must thoroughly understand the following rules for the care of horses:

Horses require gentle treatment. Docile but bold horses are apt to retaliate upon those who abuse them, while persistent kindness often reclaims vicious animals.

Before entering a horse's stall and when coming up behind him, speak to him gently, then approach quietly.

Never kick, strike about the head, or otherwise abuse a horse.

Never punish a horse except at the time he commits an offense, and then only in a proper manner.

Give the horse an opportunity to drink before leaving the picket line or stable, and before putting the bit in his mouth.

In cold weather warm the bit before putting it in the horse's mouth.

Never take a rapid gait until the horse has been warmed by gentle exercise.

When a horse is brought to the stable or picket line in a heated condition, never allow him to stand uncovered; put a blanket on him and rub his legs, or walk him until he is cool. If he is wet, put him under shelter, not in a draft, and rub him with a wisp until dry.

Never feed grain to a horse when heated. Hay will not hurt a horse however heated he may be.

Never water a horse when heated, unless the exercise or march is to be immediately resumed. Sponging out the mouth and nostrils is refreshing to the heated horse and will not hurt him.

Never throw water on any part of a horse when heated.

Never allow a horse's back to be cooled suddenly. To cool the back gradually, remove the blanket and replace it with the dry side next the horse, and replace the saddle, girthing it loosely.

Never put the horse up for the night until he is thoroughly clean, especially around his legs, pasterns, and feet.

Individual men returning from mounted duty or pass will report their return to the noncommissioned officer in charge of stables, who will inspect each horse and see that he is properly cared for.

STABLES AND STABLE MANAGEMENT

609. Foul air and dampness are the causes of many diseases of the horse; hence the importance and economy of spacious, clean, dry, and well-ventilated stables.

The picket line should be established in the immediate vicinity of the stable. The floor of the picket line should be raised, and trenches to carry off the rain should be provided, so that the ground upon which the horses stand may be kept dry.

Paddocks, with shade and water, should be provided near the stables; if there is no shade, shelter from the sun should be extemporized. The picket line and paddock should be sprinkled to keep down the dust; crude oil may be used to advantage.

Bedding racks should be provided near each stable.

The horses are assigned stalls and places on the picket line by platoons, and as nearly as prac-

ticable according to their usual place in ranks. The name and hoof number of the horse with the name of his rider is placed over the stall.

The stable sergeant takes immediate charge of the stables, picket line and paddock, forage, and stable property in general.

The stable sergeant is responsible that the stables and their surroundings are kept at all times thoroughly policed and free from smells; he is usually assisted by one or more stable orderlies.

Sufficient men are detailed as stable police to perform the general police and except at night to collect all manure as soon as it is dropped, either in stables, on the picket line, or in the paddocks. The stable police also assist in the feeding, watering, and bedding of the horses.

Manure and foul litter must not be allowed to accumulate in or near the stables, but must be carried to the manure heap daily.

In the morning, stalls are cleaned and the stables policed under direction of the stable sergeant.

The bedding is taken up, carefully shaken out, and sorted. All parts of the bedding which can be used again are taken to the bedding racks and spread thereon for a thorough drying; parts which cannot be used again are sent to the manure heap. Special attention is necessary in this matter, as the allowance of straw is insufficient under most favorable conditions. In the evening the dried bedding, mixed with such fresh straw or bedding as may be necessary, is laid down. The bed must be soft and even, with the thickest part toward the manger.

If practicable, all woodwork within reach of the horses should be protected with sheet metal or painted with a thin coat of gas tar; other woodwork and brick should be painted a light shade and then kept clean and free from dust.

Feed boxes must be kept clean; they should be washed from time to time with diluted vinegar and always after feeding bran mash or other soft food.

During the day, except in very cold or stormy weather, the horses, when not being used or fed, should stand at the picket line or in the paddocks. In hot climates, however, if there is not sufficient shade on the picket line or in the paddocks, it is better to keep the horses in the stables during the heat of the day.

Smoking in the stables is prohibited.

One or more covered lights should be provided in the stables at night.

STABLE DUTY

610. Captains are responsible for the proper performance of stable duty. In addition to the grooming, they will require such other duty as may be necessary to keep the stables, horses, and equipment in proper condition.

Mounted work must be followed immediately by "stables"; the horses are then thoroughly groomed, the saddlery cleaned and put away in perfect order.

All squadron officers will be present at this time, the platoon leaders superintending the work of their platoons.

The horses should also be brushed off before going out to drill or exercise in the morning, and in the evening before being led in.

GROOMING

611. Grooming is essential to the general health and condition of the domesticated horse. Horses improperly groomed, with ragged manes, unkempt pasterns, and feet improperly looked after, are an indication of an inefficient organization. Clean horses properly equipped and smartly turned out

add to the esprit of an organization and give a fair indication of its discipline and efficiency.

The grooming is done by platoon, under the supervision of the platoon commander and the platoon sergeant, assisted by the noncommissioned officers of the platoon.

It is not to be done in a formal or routine manner but in such a way as to bring results. Unless it is done in the stable, or where there will be danger of fire, the men will be allowed to smoke, and cheerful but not disorderly conversation will be encouraged. When a trooper has finished his work and it has been inspected, he should be allowed to attend to other duties or be dismissed.

According to circumstances, the platoon or the squadron may be marched to or from the stables or the men may be allowed to go and return individually.

On returning from a drill or exercise, and usually in the field, the horses are unbridled, girths are loosened, and they are watered and fed. The men are then free to put on stable clothes, relieve themselves, and prepare for the work of grooming and to care for their equipments while the horses' backs are being cooled under the pressure of the saddle. The men then begin their stable work comfortably and deliberately.

The captain or the officer in charge supervises generally the grooming and care of saddlery of the platoons, holding the platoon commander responsible and calling his attention to any deficiencies or neglects.

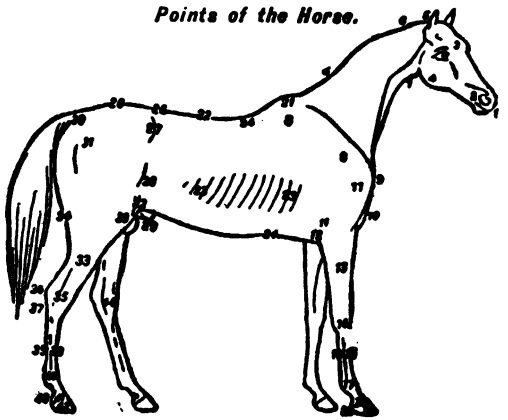
The first sergeant assists the captain or officer in charge in coordinating the work of the platoons and stable force.

The horses of the officers, of the first sergeant, and of the four platoon sergeants are groomed by designated troopers. All other noncommissioned officers and men groom their own mounts. Extra

horses and those whose riders are absent are groomed by men assigned to the work by the platoon sergeant.

The principal use of the currycomb is to clean the brush, and for this purpose a piece of hard

Points of the Horse.



Head.

1, Muzzle.
2, Nostril.
3, Forehead
4, Jaw.
5, Poll.

Neck.

6, 6, Crest.
7, Throttle or windpipe.

Fore quarter

8, 8, Shoulder blade.
9, Point of shoulder.
10, Bosom or breast.
11, 11, True arm.
12, Elbow.
13, Forearm (arm).
14, Knee.
15, Cannon bone.
16, Back sinew.
17, Fetlock or pastern joint.
18, Coronet.
19, Hoof or foot.
20, Heel.

Body or middle piece.

21, Withers.
22, Back
23, 23, Ribs (forming together the barrel or chest).
24, 24, The circumference of the chest at this point, called the girth.
25, The loins.
26, The croup.
27, The hip.
28, The flank.
29, Sheath.
30, The root of the dock or tail.

Hind quarter.

31, The hip joint, round, or whirlbone.
32, The stifle joint.
33, 33, Lower thigh or gaskin.
34, The quarters.
35, The hock.
36, The point of the hock.
37, The curb place.
38, The cannon bone.
39, The back sinew.
40, Pastern or fetlock joint.
41, Coronet.
42, Hoof or foot.
43, Heel.
44, Spavin place.

wood with channels along its surface answers equally well.

The currycomb should never be used on the legs from the knees and hocks downward nor about the head, and when occasionally required to loosen dried mud or matted hair on the fleshy parts of the body it must be applied gently.

To groom the horse proceed as follows:

Take the currycomb in the right hand, fingers over back of comb, and the brush in the left hand; first clean the legs of the near side, then take the currycomb in the left hand and the brush in the right and clean the legs of the off side. The legs will thus have time to dry while the rest of the grooming is being done. Next return to the near side, change the brush and comb into the other hands and begin brushing at the upper part of the neck, the mane being thrown to the other side out of the way; thence proceed to the chest, shoulders, back, belly, flanks, loins, and rump. The principal working of the brush should follow the direction of the hair, but in places difficult to clean it may be necessary to brush against it, finishing by leaving the hair smooth. After every few strokes clean the brush from dust with the currycomb.

In using the brush the man should stand well away from the horse, should keep his arm stiff, and should throw the weight of the body against the brush.

Having finished the near side, again take the brush in the right hand and the currycomb in the left hand and begin on the off side.

Having done with the brush, rub or dust off the horse with the grooming cloth, wipe about the face, eyes, and nostrils, arrange the mane and tail, and clean the dock. Finally go over the legs once more and clean out the hoofs. In cleaning the mane and tail begin brushing at the end of the

hair and gradually work up to the roots, separating the locks with the fingers so as to get out all scurf and dirt. Tails require frequent washing with warm water and soap. The skin under the flank and between the hind quarters must be soft, clean, and free from dust.

Currycombs, cards, or common combs must never be applied to the mane or tail; the brush, fingers, and cloth are freely used on both.

The wisp is used when the horse comes in wet and also for stimulating the coat. It is made by twisting or plaiting straw into a rope. The ends are then bent together, cut off square, and rubbed on a board until they form a soft, even straw brush.

The wisp should be worked forward and backward well into the coat, so that full advantage may be obtained from the friction. After finishing with the wisp the coat should be laid flat.

Hand rubbing is beneficial. When a horse has had very hard, exhausting work, his legs should be hand rubbed and afterwards bandaged, taking care that the bandages are not tight. An exhausted horse should also be given stimulants and warm gruel.

The value of grooming is dependent upon the force with which the brush is used and the thoroughness of the other work.

Officers and noncommissioned officers should, by continuous personal supervision, see that the grooming is properly done.

No horse should be considered in order until he is thoroughly clean; his mane and tail brushed out, and laid flat; his eyes and nostrils wiped or washed, and hoofs put in order.

The pasterns and that part of the mane where the crownpiece of the bridle rests should be neatly trimmed, and the mane and tail plucked.

At each "stables" the horses' feet and shoeing

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are carefully examined. Horses requiring shoeing are reported to the platoon sergeant, who notifies the stable sergeant.

Each horse should be inspected by an officer before the man who has groomed him is permitted to leave.

The sheath will be kept clean by washing, when necessary, with warm water and castile soap.

A good discharge from the cavalry should carry with it the presumption that the holder is a good horse manager and groom.

WATERING

612. Except when they are heated, it is desirable that the horses should have free access to water at all times. As this is usually impossible, it becomes necessary to water at stated times.

Horses should, if possible, be watered before feeding, or not until two hours after feeding. As horses rarely drink in the early morning, the watering must follow the feeding, but after the proper interval, if practicable.

A horse requires from 5 to 15 gallons of water daily, depending upon the temperature and upon the work he is doing. Except in very cold weather, horses should be watered at least three times daily—in the morning, before the noon feeding, and before the evening feeding. In warm weather, water drawn from a cold well or spring should be allowed to stand long enough for the chill to pass off before the horse is allowed to drink.

On the march the oftener the animals are watered the better, especially as it is not usually known when another watering place will be reached. By watering from buckets many watering places not otherwise available may be utilized.

If a mounted command has to march a long distance without water, so that it will be necessary

to encamp en route, the animals are fed, but denied water until just before starting, when they are permitted to drink freely. The command marches in the afternoon and does not encamp until it has accomplished at least half of the distance; it moves early the next morning to reach water.

Horses must be watered quietly and without confusion; the manner in which this duty is performed is a good test of the discipline of a mounted command.

The horses are led or ridden at a walk to and from the watering place. No crowding will be allowed, nor will any horse be hurried or have his head jerked up from the water.

The horses are watered under the immediate direction of the senior officer or noncommissioned officer present at stables or at other time of watering; an officer should always be present when the horses of other commands are liable to be met at the watering places.

FEEDING

613. Horses should be fed three times a day—at reveille, in the middle of the day, and at night. This rule must be rigidly enforced on the march, the noon grain feed being carried on the horse. Ordinarily one-third of the grain ration is fed each time. Hay, as a rule, is not fed in the morning, but about one-third of the ration should be fed at noon, except on the march, and the remainder at night.

The use of bran once or twice a week is important for stabled horses. In spring or early summer they should be grazed. A lump of rock salt should be kept in each manger.

Before feeding hay it should be thoroughly shaken out with a fork, so as to get rid of dust

and seed; it is also advisable to moisten the hay before giving it to the horse. The grain, if possible, should be run over wire screens or allowed to fall through the air so as to remove dust.

It is advisable to feed at least a portion of the allowance of hay before feeding the grain.

Grain should never be fed or placed in the mangers until it is certain that the horses are thoroughly cool

In the morning the horses are usually fed at or before reveille. The noon feed of hay is usually placed in the mangers while the organization is at drill, but the grain is not fed until the horses are thoroughly cool.

The evening feed is placed in the mangers after the stable has been thoroughly policed for the night.

All horses do not require the same amount of forage; the amount given each horse must be based, therefore, upon his individual requirements.

When forage cannot be obtained, grazing should be required at every spare moment, especially early in the morning when dew is on the grass.

All forage received by an organization should be checked for weight and to see that it is up to contract specifications. All officers should be familiar with the characteristics of good forage and the manner in which it is commercially graded for contract specifications. To obtain this knowledge, officers should be encouraged to visit large commercial stables.

The daily allowance of oats, barley, or corn is 12 pounds for each horse; that of hay, 14 pounds. The allowance of straw for bedding is 100 pounds per month for each animal.

Good oats weigh about 40 pounds to the bushel; barley, about 48 pounds; corn, about 56 pounds. Pressed hay weighs about 11 pounds per cubic foot.

The standard bushel in the United States contains 2,150.4 cubic inches. A cubic yard contains 21.69 bushels. A box 16 by 16.8 by 8 inches holds 1 bushel; a box 12 by 11.2 by 8 inches holds half a bushel; a box 8 by 8 by 8.4 inches holds 1 peck; a box 8 by 8 by 4.2 inches holds one-half peck, or 4 quarts.

EXERCISING

614. To keep a horse in good condition he should have two hours' exercise daily. This exercise should be **under the saddle,** or, if that is impracticable, it should be given by leading beside another horse.

In leading care must be taken to lead as much on the left as on the more convenient right side. This can be automatically regulated by having the leading done on the right side on the odd numbered days of the month and on the left on the even numbered days.

In special cases it may be given on the longe, but this must be done under proper supervision or injury may result.

Turning a horse loose in a paddock does not give him proper exercise, and if the paddock is a large one, where he can get up speed, it results in giving him a taste for freedom which inspires a high-spirited animal to try to get rid of his rider when he feels like having a run.

The horse should associate the control of a rider with the pleasure of all exercise, so that he may accept it naturally as a fixed habit.

It is objectionable for one man to lead more than one extra horse for exercise, as the gaits must then be more restricted, and on ordinary roads the footing for some of the horses will be poor.

If a large space is available for paddock purposes it should be divided into several inclosures,

giving space for a part of the animals to move about quietly in each, but not enough to encourage them to gallop.

SICK HORSES

615. Horses on sick report are under the immediate charge of the stable sergeant, assisted by the farrier.

When a veterinarian is present he should prescribe the treatment to be given to sick horses, and he should inspect all sick horses at least once daily.

The veterinarian should also visit each organization at least once a day at one of the stated "stables;" he should be freely consulted as to minor ailments and as to the means of keeping the horses in fit condition.

In the absence of a veterinarian the sick horses are treated by the stable sergeants under the direction of the captain.

Serious disease is best avoided by immediate and constant attention to minor ailments, galls, etc.

If a horse sustains an injury, neglects his food, refuses water, or gives any evidence of sickness, his condition should be reported at once to the stable sergeant. It is the duty of any man observing such condition to make the necessary report.

SHOEING

616. Horses will be shod according to the principles outlined in the authorized manual.

All officers must understand the principles of proper shoeing and be able to supervise the work of the horseshoers.

A trooper should know how to put on a shoe in an emergency; the following extracts from the manual are therefore here incorporated:

The Army Horseshoer, 1912.—The foot should be prepared so that it will approximate as nearly as possible to a state of nature, and only such trimming is allowed as is absolutely necessary for the purpose of fitting and securing the shoe.

The knife must never be used on the bars or on the frog. The bars strengthen the hoof and assist in its expansion. Cutting, therefore, weakens them and prevents them from performing their function.

The practice of using the knife to trim the bars or to cut a notch at the junction of the frog and bar at the heel (called opening the heels in civilian shops) always tends to produce contracted feet.

Never use a knife on the hoof of a horse that has been running barefoot nor on flat feet.

Ragged parts of the frog may be cut away by careful use of the nippers.

With a flat foot it is frequently necessary to remove a part of the outer edge of the wall in order that the nails may be driven in the white line where they belong. This is the only case where it is permitted to rasp the outside wall. The outer coating of the wall and the layers of dead horn on the sole and frog serve to retain the moisture in the hoof.

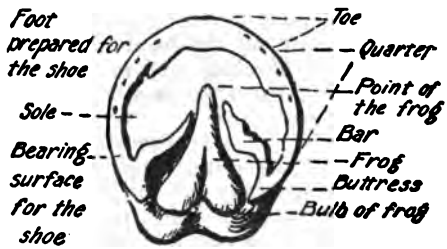
The hot shoe must never be applied to the horse's foot under any circumstances.

When shoes are left on the feet for too great a length of time corns and other ailments result. Ordinarily a shoe should be removed once a month. The lightest shoe that will last for this time is the best shoe. It should carefully follow the form of the foot, or if the foot is broken the shoe follows the original shape of the foot. Its length is regulated by the bulb of the frog.

The ground surface of the shoe should be level and smooth, except for use in snow, when the shoe with the ground surface concaved prevents balling. That portion of the upper surface which

presses against the bearing surface of the foot must be level, smooth, and accurately shaped to support it, and when the upper shoe surface is wider than the bearing surface the inner edge must be **concaved to avoid excessive sole pressure.** This is one of the most important requisites of correct horseshoeing. Concussion of the sole against the inner edge of the upper shoe surface invariably produces soreness.

One side of the shank of a horse nail is flat. The other side is concave and also has a bevel



near the point. This bevel as it enters into the horn forces the point of the nail in the direction of the other side (flat side). Therefore in driving a nail always hold it with the flat side toward outside edge of the shoe.

Nails should come out at a height of not more than 1 inch from the bottom of the hoof.

In garrison, at the discretion of the colonel or of the commanding officer, the horses may be left unshod, but shoes will be kept fitted for each horse ready to be put on.

Inspection of Shoeing.—The following examination should be made while the horse is standing on a level floor with the foot on the ground.

(a) Are the axes correct when viewed from the front and from the side?

(b) Does the shoe follow the outer line of the wall to the last nail hole and from there extend outward, allowing about one-eighth of an inch at the heel for expansion? Has the rule against rasping the hoof to fit the shoe been violated?

(c) Is the toe clip in the center properly made and properly seated?

(d) Are the nails driven at the proper height and proper distance apart? Have any old stubs been left in the wall?

(e) Are the clinches well turned and set in, of the proper size, and have they been smoothed off but not rasped sufficiently to weaken them?

The foot should then be raised and the examination continued.

(f) Is the shoe of the proper size and weight; the last nail hole back of the bend of the quarter?

(g) Has enough horn been removed; has too much been removed; is the foot level?

(h) Does the shoe rest evenly on the wall, covering the buttresses and showing no air space at any point?

(i) Is the shoe properly concaved so as to avoid pressure on the sole?

(j) Has the knife been used on the bars, sole, or frog?

(k) Are the nails well seated and of the proper size?

(l) Are the heels of the shoe correct in width and thickness and are they properly rounded without sharp edges or points? Is their length even with the bulb of the frog?

Care of Saddlery

617. The saddlery and equipment must always be cleaned after use. This duty, like the care of the horse, is to be regarded as part of the mounted duty itself; thus a drill is not over until horse,

saddlery, arms, and equipments have been put again in condition. According to need the leather is simply wiped off with a damp sponge or well soaped and cleaned. In no case must it be soaked with water.

If the soap used does not contain a sufficient amount of free oil the leather must be oiled to keep it pliable. A mixture of one-half neat's-foot oil and one-half mutton tallow, well rubbed in, keeps leather in good condition. Special care is taken to keep the underside of the skirts of the saddle and the parts which do not come in contact with the clothing well oiled. The seat and outside of the skirts will rarely require oil.

Metal parts are kept clean and free from rust; they may require oiling if not regularly used.

The saddle blanket must be kept clean and soft and free from wrinkles. After use it must be dried and then well shaken (unfolded). It must never be folded wet and left thus with the saddle. Provision will be made in the saddle room or stables for hanging it up to dry.

In the field its use as bedding for the men will not be allowed and special care will then be exercised to keep it free from dirt.

When necessary the blanket should be thoroughly cleansed by repeated immersions in tepid soapsuds and hung over a pole or line to dry without wringing or pressing it.

FITTING THE SADDLE

618. There are six axioms in saddle fitting:

(a) The withers must not be pinched nor pressed upon.

(b) The central line of the back must have no pressure put upon it.

(c) The shoulder blades must have full and unhampered movement.

(d) The loins must not carry weight.

(e) The weight must be put upon the ribs through the medium of the muscles covering them.

(f) The weight must be **evenly distributed** over a surface which extends from the play of the shoulders to the last true rib.

The regulation saddle adjusts itself automatically to the width of the horse's back. This automatic adjustment is brought about by applying all the weight that is to come upon the side bars, through their center of rotation, thus leaving the side bar of the loaded saddle free to adapt itself to the varying width of the back.

In order to preserve this freedom, no attachments of any kind should be placed on the side bar, other than as issued, and no weight should be permitted to rest on the side bars other than that transmitted to them through the hinges. The cantle roll support and straps have been devised especially to raise the roll and keep all weight off the side bars.

While the side bars adapt themselves automatically to the slope of the horse's back it is necessary to ascertain whether they bear evenly on the back and whether the arch and seat are clear of the spine.

To determine this the saddle is placed first on the naked back, the **front** of the side bar resting in the pit of the shoulder (the hollow back of the shoulder blade). If there is then sufficient clearance of the withers and backbone no trouble will be encountered when the saddle is put on with a blanket.

A new blanket is then folded and placed in proper position on the back and the saddle placed on the blanket so that the front end of the side bar approaches closely the shoulder blade without pressing upon it. The blanket is pushed well up into the pommel arch. The saddle is now girthed and a man placed in the saddle.

It must be kept in mind that the blanket reduces the width of the pommel arch and narrows the saddle across the top of the side bars.

The fit of the saddle can never be determined without seeing a man in it; parts may appear out of harm's way, when no weight is in the saddle, which are brought dangerously close under the pressure of a man's weight.

The first thing to ascertain is the freedom from pressure on the withers; the hand must pass readily between the blanket and the withers, over the top as well as along the side.

In applying this test the man in the saddle should lean forward and the examiner must not be satisfied with anything less than the introduction of the entire hand.

The next thing is to ascertain freedom from pressure on the shoulder blade. This is done by passing the hand underneath the blanket from the front until the play of the shoulder blade can be felt. The foreleg is raised and advanced to its full extent to the front by an assistant while the hand is in this position. If this can be done, while the man in the saddle is leaning forward, without pinching the fingers between the side bars and the shoulder blade the fit in this respect is satisfactory. The test should be made on both shoulders.

If the fingers are pinched the shoulder blades will be pinched and the saddle must be raised by folding the saddle blanket up on each side, so as to place extra thickness under the bars or by placing extra felt on the side bars.

The rear ends of the bars are next tested for loin pressure with the man in the saddle leaning back. The flat of the hand should find ready admission between the ends of the bars and the loins.

Assuming that the above defects have been remedied the saddle should be ridden in for half

an hour or more to ascertain whether the pressure of the side bars is evenly distributed.

On completion of the ride the saddle is carefully ungirthed and lifted from the blanket without disturbing it in any way. The blanket will be found to bear the imprint of the side bars and an examination of this depression will show at a glance whether the bars press evenly from top to bottom and from front to rear.

The examination must be quickly made as the blanket soon loses the impression of the side bars.

Any irregularity in the fit of the side bars may be remedied by the introduction of pieces of felt to fill up the spaces between the side bars and the blanket. With very little practice these pieces of felt may be cut to the required shape and thickness with a very sharp knife. Some edges will need to be as thin as a knife edge; other parts may require the addition of more than one thickness.

After determining where these pieces of felt are to rest on the wooden side bars they are placed in the upper and inner side of the felt coverings of these bars and fastened in the proper place with a few stitches of thread.

The most radical alterations in the fit of the side bar can be effected with these strips; the method is simple and quick, and does not require a trained workman.

It must not be forgotten that no matter how much care may be taken in fitting a saddle, such fitting is only adapted to the horse in the condition in which he is at the time.

On active service the saddles require daily attention. They should be inspected as regularly as are the feet. Every weak point in the fit of a saddle in the squadron should be known and the remedy arranged for. In no other way is it possible to bring horses through severe work with sound backs.

VI

Field Artillery

Based on Provisional Drill and Service Regulations for Field Artillery (1916).

619. Field artillery is an auxiliary arm. It is used in combination with infantry and cavalry or both, principally the former. As the infantry is really "the army" so is field artillery the right arm of the infantry. It is used to augment the fire of the infantry small arms. It prepares the way for subsequent operations of the other arms by its fire upon the enemy when out of range of small arms. It is used to destroy the protecting fortifications, intrenchments, wire entanglements, etc., of the enemy and also supports and protects the maneuvers of the other arms.

Napoleon said: "Mediocre infantry needs a great deal of artillery." Artilleryman as he was, little did he realize the true rôle and possibilities of this arm. Before the present war it was fully established that as a fundamental principle infantry in modern combat must have artillery to succeed in an attack of any magnitude, and further that simultaneous and cooperative action of the two arms is absolutely necessary. In the present war the field artillery has played a part so enormous and important, so accurate and so deadly, that its greatest achievements in the past now seem insignificant.

The tactics, or the art, of using artillery on the field of battle has changed greatly in recent years, more so than that of any other arm, as wonderfully and terribly demonstrated by its use in the present war in western Europe. The tactics of

any arm must change more or less with the improvement of its weapon. The artillery weapon of to-day is a highly developed machine; it is in many respects an instrument of precision. In the trench warfare of to-day the infantry lines are so close together that the position of the artillery has been moved miles to the rear. The artillery can no longer occupy the firing line of the infantry. Its safety lies wholly in its concealment.

Until quite recent years it was thought that artillery should avoid firing over the infantry of its own army unless absolutely necessary, and then only when the enemy was a considerable distance to the front of its own infantry line. When so employed the rule was to use only percussion fuzes in the shrapnel and shell, as the time fuze was too inaccurate for safe use. The great improvements in the design and construction of the weapon and fuze, together with the great accuracy of fire control, has enabled the artillery to fire with safety over its own infantry at the enemy as close as forty and fifty yards. These same improvements in the weapon and its use have naturally increased the demands for and upon the artillery, until to-day every advance of the infantry must be preceded or prepared by a "curtain" of fire upon the enemy intrenchments, which only ceases as the infantry rush reaches the enemy trenches. So close is the cooperation of the infantry and artillery that few losses are suffered by the infantry from its own artillery in rear. This use of artillery is, however, based upon the theory that it is much better for the infantry rush to lose a few men from the fire of its own artillery in keeping the enemy infantry under cover until the last moment than to have the artillery fire stopped before the trench is reached and by so doing permit the enemy to make full use of his rifle and machine-gun fire in inflicting greater losses to the

attack. Artillery fire for this purpose is controlled by observers placed in the infantry trenches and connected by telephone with the batteries. They supply the data for adjusting the fire upon the enemy, and give the word for cessation of fire as the infantry rush nears the enemy trenches.

CLASSIFICATION

CLASSIFICATION OF GUNS

620. The guns of field artillery are classified according to methods of fire, as field guns and howitzers, and with reference to size and mobility, they may be further classified as light and heavy artillery.

FIELD GUNS

The principal characteristic of field guns is that they fire a comparatively light projectile at high velocity with a very flat trajectory. In appearance the barrels are long and thin. They vary in size from the light horse-drawn 75-mm., or 3-inch gun, to the larger 10- and 12-inch tractor and railway types in use in Europe to-day, some of which are fired from special heavy field carriages similar to the mounts used by naval and seacoast guns and others from special railway carriages. The principal characteristic of howitzers is that they fire a comparatively heavy projectile at low velocity with a high and very curved trajectory. In appearance they are shorter and heavier than field guns. They vary in size from the light trench mortars of Europe and our 2.95-inch mountain gun to the 42-cm. tractor howitzers introduced in the present war.

The high and very curved trajectory of the howitzer permits of a wider range of action from concealed positions, as it can take positions behind high hills and deliver its fire upon an enemy close at hand, whereas the field gun with its flat

trajectory and the acute angle of its projectile under similar conditions might have to be located miles to the rear in order to clear the crest of the hills.

A projectile of any given weight, with its flat trajectory when fired from a field gun, requires a much higher velocity, due to the force of gravity, to attain the same range as one of the same weight fired from a howitzer with its high angle fire. The greater muzzle velocities used by field guns, therefore, require much greater powder charges than used in howitzers of the same caliber.

SIZE AND MOBILITY

Until quite recently the power of the horse has completely dominated the use of field artillery. The mobility of the weapon has naturally been the controlling element in its design and use. The term light artillery has been used to designate all forms of artillery that could maneuver with troops in the field, such as horse, light, and mountain artillery. The size of the guns has been limited in general to 3 inches, and the weight has been restricted so as to require not more than six horses to draw the wheeled pieces. The term heavy artillery has included all field artillery heavier than the 3-inch gun and too heavy to maneuver with troops in the field, though mobile enough to accompany an army in the field. This term should now include all the forms of heavy artillery drawn by tractors and carried on railway cars, some of which has been designated as siege artillery.

U. S. Artillery

MATÉRIEL

621. In our service we have at present two types of the field gun, the light 3-inch drawn

by six horses, which fires a 15-pound projectile, and the 4.7-inch drawn by eight horses, which fires a 60-pound projectile. The former has the greatest mobility, and is intended for infantry and cavalry divisions. The latter is intended for assignment to field armies. The 3-inch batteries of the cavalry division are called horse artillery. The same type of gun and carriage is used but the cannoneers are mounted on horses instead of riding on the limbers, and the limber chests are not loaded. In this way greater mobility is obtained. A new 3-inch mountain gun, with long recoil and latest type of laying gear, has been designed for pack transportation, and it is expected that it will be issued to the service shortly.

We have three types of howitzers, the 2.95-inch mountain gun carried on mules, which fires a 12.5-pound projectile; the 3.8-inch, of the same weight as the 3-inch field piece, which fires a 30-pound projectile; the 4.7-inch drawn by six horses, which fires a 60-pound projectile; and the 6-inch drawn by eight horses, which fires a 120-pound projectile. The 3.8-inch and the 4.7-inch howitzers are intended for assignment to infantry divisions at the rate of one battalion of either to three battalions of the 3-inch guns.

As a result of this war we will undoubtedly be compelled to adopt in the near future types of field guns and howitzers much larger than those now in use in this country. They will necessarily be of the tractor and railway types. The guns will probably run to 12 and 14 inches and the howitzers to 16 inches or greater.

THE 3-INCH FIELD GUN

622. It is impossible in this book to describe each of the various types of guns and howitzers in our service, each of which is fully described in handbooks issued to the service, but a brief de-

scription of the 3-inch piece, which is the predominating weapon and which is similar to the best types of foreign countries, may be of some interest.

The 3-inch gun is 88 inches long and weighs about 800 pounds. It is built up of nickel steel, and consists of a tube, jacket, locking hoop, and clip. It is mounted in a cradle by means of guides and clips. The breech block is of the interrupted-screw type. The firing mechanism is designed for percussion firing and belongs to the continuous-pull type. The piece may be fired either by lanyard or trigger handle. The carriage is of the long-recoil type and remains stationary when fired. Its principal parts are the wheels, axle, trail, and elevating mechanism forming the lower carriage, the cradle and recoil-controlling parts constituting the upper carriage, and the rocker and traversing mechanism intermediate between the two. The gun recoils 45 inches when fired.

It carries with it a cylinder filled with oil. Inside of the cylinder is a piston rod carrying a fixed piston, the rod being fixed to a nonrecoiling part of the carriage. The oil during recoil is forced through small openings in the piston and absorbs the greater part of the energy of recoil. A small part is absorbed by the counterrecoil springs which are compressed by recoil and then return the gun to the firing position.

The elevating mechanism permits of an elevation of 15 degrees above and a depression of 5 degrees below the horizontal. The traversing mechanism permits of the gun being traversed 4 degrees on each side of the normal. A folding shield is provided for the protection of the cannoneers against rifle fire. Ammunition carriers are provided under the seats for four rounds of ammunition for emergencies.

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623. The instruments provided for sighting and laying the piece include a line sight, front and rear sights, a panoramic sight, and a range quadrant. The line sight consists of a conical point screwed into the locking hoop and a V-notch attached to the breech end of the jacket. They are useful in giving general direction to the gun. The front and rear sights are for general use in direct aiming. They are supported from the cradle on the left of the piece, and consist of a front sight with cross wires and a rear sight of the peep variety.

624. The panoramic sight is a vertical telescope so fitted with reflecting prisms that the gunner with his eye at the eyepiece, which is fixed in a horizontal position, may bring into the field of view an object situated at any point in a plane perpendicular to the axis of the telescope. It is fastened to the rear sight. The hood of the objective is capable of complete rotation and the amount of rotation is measured by a limb dividing the circle into 64 parts and a micrometer for dividing each of these into 100 parts. The smallest reading, called a mil, is 1-6400th of a circle. Practically, the subdivisions of the deflection scale on the panoramic sight are considered as points equal to 1-1000th of the range. At 0 the line of sight is parallel to the plane through the axis of the gun; at 16 (or 1,600 mils) it is perpendicular to that plane and pointing directly to the right. The principal use of this sight is in indirect laying. The horizontal angle between the target and an aiming point, such as a tree or chimney, being known, the gunner sets off the angle on the sight and then lays on the aiming point and the gun is then pointing in the direction of the target.

625. The range quadrant is an instrument placed on the right side of the cradle for laying

the gun in elevation. It has a range scale graduated in yards and an angle of site scale graduated in mils for correcting for differences in height of site between gun and target. It has cross levels with leveling screws. In using it the range disk is set at the proper range, correction is made for difference in level of wheels and then the correction is made on the scale of the elevation-level holder for angle of site. The bubble of the range level is then brought to the center by elevating or depressing the gun. The gun will then have the correct elevation (corrected for angle of site) corresponding to range of target.

626. The carriage with four rounds of ammunition weighs 1,685 pounds, gun and carriage complete 2,520 pounds. The limber with its supply of 36 rounds of ammunition weighs 1,740 pounds. The gun, carriage, and limber completely equipped with forty rounds of ammunition then weighs 4,260 pounds.

627. The caissons are provided to carry ammunition. They have the same limber as the piece and carry seventy rounds of ammunition each. Total for caisson and limber is 106 rounds. The body is of steel and the chest door is made of the same steel as the shield of the gun. An apron shield is hinged under the axle. The caissons thus give about as much protection to the cannoneers as does the carriage. Each caisson carries a fuze setter.

COMBAT TRANSPORTATION

In addition to the guns, caissons, and their limbers, each battery is supplied with a forge limber, battery wagon, store limber and store wagon that belong to the combat train. The forge limber carries a forge, anvil, smith's and machinist's tools, horseshoes and nails.

628. The battery wagon carries tools and spare wheels and parts for the battery. It is provided with compartments for the saddler's chest, carpenter's chest, cleaning materials, and small stores for the artificer's use, and other small articles. The forge limber and battery wagon are together drawn by six horses. The combined weight loaded and equipped is 4,324 pounds.

629. The store limber carries the fire-control equipment, such as the range finder, battery commander's telescope, rulers, flashlights, field glasses, telephones, wire, cable, reels, and other articles. The store wagon carries additional wheels, stores, spare parts, and materials that cannot be carried in the battery wagon. The store limber and wagon are together drawn by six horses. When fully loaded and equipped the combined weight is 4,008 pounds.

AMMUNITION

630. Fixed ammunition is used in the 3-inch field guns, and is made up with either common shrapnel, high explosive shrapnel, or common steel shell. The rounds as made up vary in length with the type of projectile used. The ammunition chests of the battery are of sufficient size to take any one of the rounds furnished, so that the number of each kind to be carried is a matter for regulation by proper authority. Each round is issued with projectile filled and fuzed. The weight of the projectile is 15 pounds, and the total weight of one round is 18.75 pounds. The components of one round are the cartridge case with primer, the powder charge, igniter, projectile, and fuze.

THE CARTRIDGE CASE

The cartridge case is a solid drawn-brass case 10.8 inches long; it has a capacity of 66.5 cubic inches, and weighs, with primer, 2.25 pounds.

The head of the case has a projecting flange or rim under which the lip of the extractor engages. The center of the head is bored out to receive the primer, which is a small brass tube containing a small amount of percussion composition which

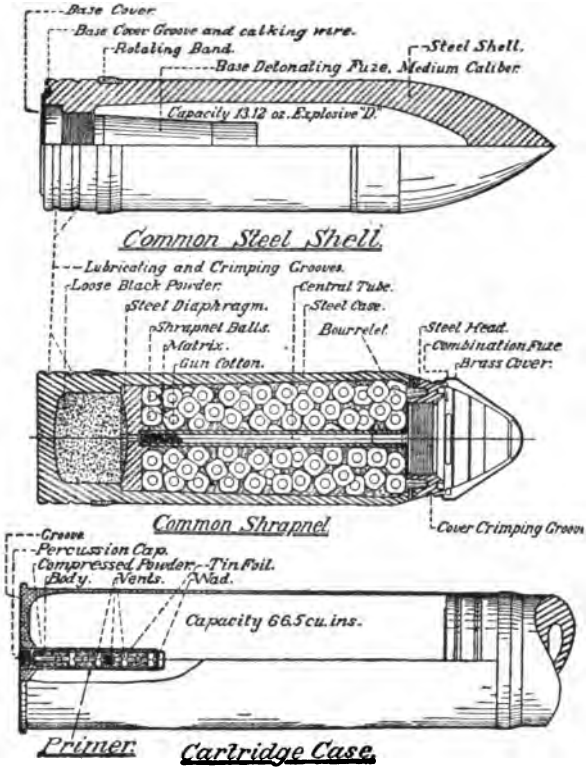

Plate 31.

explodes on receiving the blow from the firing pin, and an auxiliary charge of black powder to communicate the flame to the powder charge.

The Powder Charge

The powder is a nitrocellulose powder composed of multiperforated (7 perforations) cylindrical grains, each 0.35 inch long and 0.195 inch in diameter. The charge varies slightly for different lots of powder, but is approximately 24 ounces. In making up the cartridges a packing of paper, felt, or excelsior is placed next to the projectile if necessary to fill the cartridge case, thus holding the powder charge in the rear portion of the cartridge case in contact with the primer. A front igniter of black powder weighing one-fourth ounce is used. The charge gives a muzzle velocity for shrapnel of 1,700 feet per second, with a maximum pressure in the bore not exceeding 33,000 pounds per square inch.

The muzzle velocity of 1,700 feet per second for shrapnel is the standard; for cartridges made up with high-explosive steel shell (and with cast-iron shell, when issued) the muzzle velocity, and consequently the powder charge, is so varied as to make the range corresponding to a given elevation as nearly as practicable equal to the shrapnel range for the same elevation. This permits the use of but one range table for all kinds of ammunition and enables the kind of ammunition (type of projectile) to be changed without change of elevation.

Projectiles and Fuzes

631. The shell consists of a steel case with a bursting charge of high explosive which detonates upon striking.

The **common shrapnel** consists of a steel case

containing about 250 bullets and a bursting charge of black powder in the base.

The high-explosive shrapnel (H. E. shrapnel) is similar to the common shrapnel, except that it contains not only the base charge but a high explosive intermingled with the shrapnel bullets. This shrapnel is fitted with a fuze that causes the high explosive to detonate upon striking.

If either the common or the high-explosive shrapnel bursts in air the case is not ruptured, but the base charge forces the nose off the shrapnel case and expels the bullets to the front in the general shape of a cone, called the shrapnel cone.

All shells are provided with **percussion** fuzes only.

All shrapnel are provided with **combination** fuzes containing both percussion and time elements. The percussion element acts if the time element has not acted before the projectile strikes. If the combination fuze be set at safety the time element cannot act but the percussion element may.

THE FUZE SETTER

632. The fuze setter is a device for the rapid and accurate setting of fuzes for various ranges and heights of burst. Two kinds are used; the bracket fuze setter and the hand fuze setter. The former is attached to the rear end of the fuze-setter bracket on the caisson, and the latter is furnished for use in case of damage to the bracket fuze setter, or in case the gun should be separated from its caisson. One hand fuze setter is carried in the trail box of each gun.

The fuze setter has two scales; a range scale or ring for setting ranges and a corrector scale for varying the height of burst of shrapnel and to compensate errors made in determining the angle

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of sight and variations in the rate of burning of the time train of the fuze.

The range scale is graduated in yards from 0 to

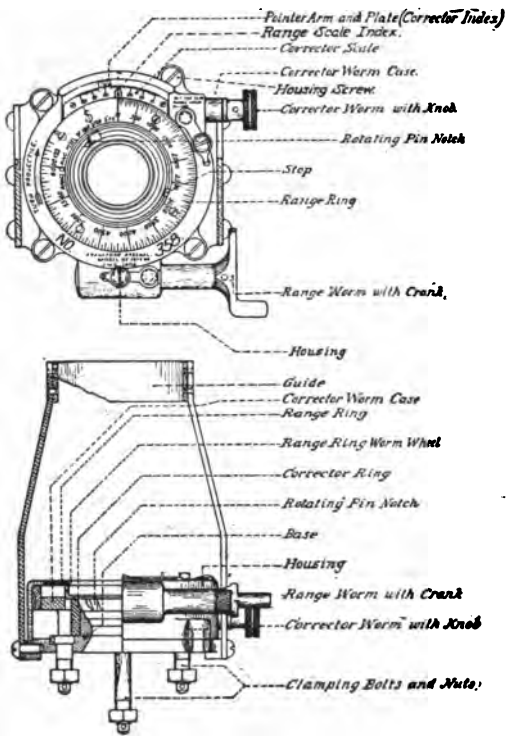

Plate 32.

6,400, its least reading being 50 yards. When a shrapnel is turned in the fuze setter, the fuze is set so that the projectile will burst, after being

fired, at about the range set off on the range scale.

The corrector scale is uniformly graduated into 60 divisions. Every tenth division is numbered in figures 0, 10, 20,—60. The purpose of the device is to change the time of burning of the fuze, inde-

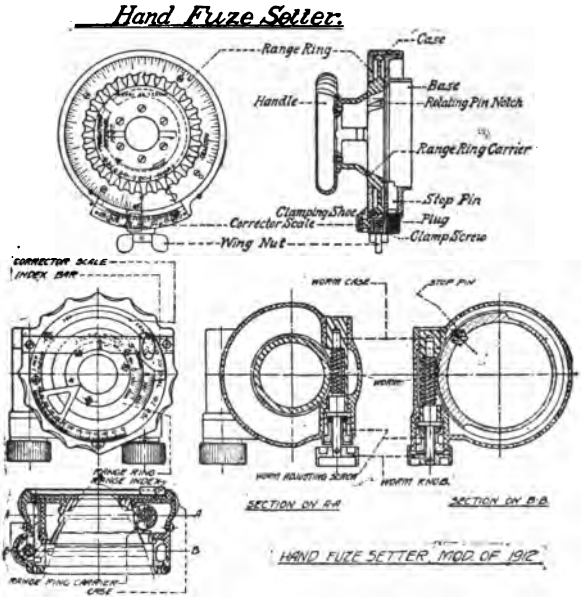

Plate 33.

pendently of the range scale, and thus to control the point at which the projectile bursts. Under normal conditions a change of fuze setting by one unit of this scale produces a variation of about 1 mil in the height of burst of the projectile. The middle graduation of the scale, 30, corre-

sponds theoretically to the normal height of burst, 3 mils.

Increasing the corrector reading shortens the time of burning of the fuze and hence raises the point of burst of the projectile; decreasing the corrector reading lengthens the time of burning of the fuze and hence lowers the point of burst of the projectile.

The corrector scale thus affords the means of correcting an observed error in height of burst and of adjusting the mean point of burst at the proper height.

When setting a fuze to explode on impact or for safe transportation the "S" on the range ring should be set opposite the range-scale index and the pointer-arm index set opposite 30 on the corrector scale. Great care should be exercised in making this setting.

THE BATTERY COMMANDER'S TELESCOPE

633. The battery commander's telescope is an instrument of precision for measuring horizontal and vertical angles, and combines the essentials of a surveyor's angle-measuring instrument with those more particularly pertaining to the requirements of the military service. One is supplied to each battery.

THE BATTERY COMMANDER'S RULER

634. The battery commander's ruler is a small slide ruler with a cord about 24 inches long passing through a hole in the center. On one side are placed two scales, used for measuring azimuths, and a slide rule for determining the height of the trajectory in mils at any point of the range. On the other side is engraved a table of parallaxes computed for a base of 20 yards for different

angles of obliquity of the aiming point. In using the ruler the end of the cord is fastened to the top button of the coat or held in any convenient way so that the center of the ruler is 20 inches from the eye. The ruler is held perpendicular to the taut cord. The scale on the edge of the ruler measures in mils the visual angle subtended by the portion of the ruler. Ten of these rulers are furnished to each battery.

RANGE FINDERS

635. A Goerz meter base self-contained range finder has been adopted for our service. One will be issued to each battery. This instrument weighs 25 pounds. It has a maximum range of 20,000 yards. It has means for measuring angle of site and for quick adjustment.

A Goerz scissors type observing instrument has also been adopted.

OBSERVATION LADDERS

Various experiments and tests have been made with types of observation masts and ladders and it is very likely that a sliding and folding type will be adopted. The height to be about 25 feet, with provisions for an observer's seat and a support for the observing instrument.

ORGANIZATION

THE BATTERY

636. In our service all field batteries, mountain, light and heavy, are organized on the four-gun basis; the details vary with the different types, but all are similar to the 3-inch battery. Each 3-inch battery has four guns and twelve caissons. One caisson is attached to each gun forming four

gun sections, the other caissons forming four caisson sections.

637. On a war footing, the battery is organized in nine sections.

The first, second, third, and fourth sections are gun sections.

The fifth, sixth, seventh, and eighth sections are caisson sections.

The ninth section comprises the battery wagon, the store wagon, and the allotted field wagons.

The first and second sections constitute the first platoon. It is commanded by the senior lieutenant.

The third and fourth sections constitute the second platoon. It is commanded by the lieutenant second in rank.

The fifth and sixth sections constitute the third platoon. It is commanded by the lieutenant third in rank.

The seventh and eighth sections constitute the fourth platoon. It is commanded by the lieutenant fourth in rank.

The ninth section is commanded by the quartermaster sergeant.

638. On subdivision for action the battery is divided into the **firing battery,** the **combat train,** and the **field train.**

The firing battery comprises the first five sections. It is under the immediate command of the captain.

The combat train comprises the sixth, seventh, and eighth sections, the battery wagon, the store wagon, the reserve men and at least one pair of harnessed wheel horses and one pair of harnessed lead horses.

It is commanded by the junior lieutenant, who is assisted by the stable sergeant.

The field train comprises the allotted field wagons and such personnel as may be directed to ac-

company them. It is commanded by the quartermaster sergeant.

639. On a peace footing the seventh and eighth sections are not manned or horsed. With this exception, the personnel, animals, and matériel allowed on a peace footing are organized as prescribed for a war footing, the captain making such assignments as may be necessary to replace personnel and animals not authorized on a peace footing.

640. The **battery of maneuver** is ordinarily composed of the first, second, and third platoons, manned, horsed, and equipped. The instruction, however, is applicable to a greater or less number of platoons. For the training of horses and drivers, the entire battery is practiced in marching and maneuvering; before taking the **order in battery,** however, the battery is subdivided for action, the fifth section forming part of the firing battery, the sixth section representing the combat train.

641. The personnel of the battery of maneuver comprises the captain, four lieutenants, the first sergeant, six chiefs of section, four gun squads, two caisson squads, the musicians, the guidon, and a driver to each pair of horses.

THE BATTALION AND REGIMENT

642. The present law provides that mountain and light artillery gun or howitzer battalions serving with the infantry divisions shall consist of three batteries each, and that horse and heavy field artillery gun or howitzer battalions shall consist of two batteries each. The law provides that the regiment shall consist of as many battalions as the President may direct, and further that nothing shall prevent the assembling, in the same regiment, of gun and howitzer battalions of different

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calibers and classes. War Department orders recently provided regimental organizations of two battalions each for light and mountain artillery and three battalions each for horse and heavy artillery.

DIVISIONAL AND FIELD ARMY ARTILLERY

643. The Tables of Organization, United States army, provide an artillery brigade of two regiments of two battalions each, of light artillery for each infantry division, and that the total of four battalions may be three battalions of 3-inch guns with one battalion of either 3.8-inch or 4.7-inch howitzers. These tables provide one regiment of three battalions of heavy artillery and one regiment of two battalions of mountain artillery for each field army. The regiment of heavy artillery to consist of one battalion of 4.7-inch howitzers (six horses), one of 4.7-inch guns (eight horses), and one of 6-inch howitzers (eight horses).

As a result of the present war the General Staff has recommended that the artillery brigade be increased to three regiments, and that each field army have three regiments of heavy artillery instead of one.

THE BATTERY DISMOUNTED

GENERAL PRINCIPLES AND ORGANIZATION

644. The instruction prescribed for the battery dismounted is applicable, with obvious modification, to the instruction of any number of platoons, sections, or squads dismounted.

645. For technical, tactical, and administrative purposes the enlisted personnel of the battery is assigned to sections. A **section dismounted** consists of one sergeant, who is chief of section, and all the men assigned to the service of a piece and

its caisson, called a **gun section**; or to the service of two caissons, called a **caisson section.** The leading caisson of a caisson section is the **first caisson**; the rear caisson, the **second caisson.** The section assigned to the service of the battery wagon and the store wagon and to the service of the tools carried in those wagons is called the **ninth section.** The section assigned to the service of supply is called the **supply section.** At dismounted formations the members of the supply section, unless assigned elsewhere, habitually form in the line of file closers of the ninth section.

646. The first four sections of the battery are **gun sections.** The remaining sections, except the ninth section and the supply section, are **caisson sections.** Each gun section consists of a **gun squad** and a **driver squad.** Each caisson section consists of a **caisson squad** and a **driver squad.** The ninth section consists of a **mechanic squad** and a **driver squad.**

647. Each **section dismounted** is formed in line, with the gun squad, caisson squad, or mechanic squad on the right, the driver squad on the left. Men temporarily attached to sections fall in the line of file closers or at such other places as may be designated.

648. Each **gun squad** consists of one of the corporals and seven of the privates assigned to the service of a gun section. The corporal is the **gunner** and should be selected for his qualifications without regard to his rank in the section. The privates are **cannoneers,** numbered from No. 1 to No. 7.

649. Each **caisson squad** consists of one of the corporals and seven of the privates assigned to the service of a caisson section. The corporal is a **caisson corporal.** The privates are **cannoneers,** three of whom are assigned to the first caisson

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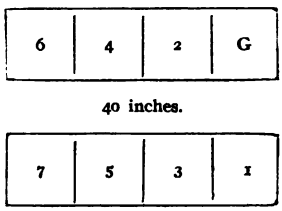
and numbered from No. 4 to No. 6, and the remaining four to the second caisson and numbered from No. 4 to No, 7.

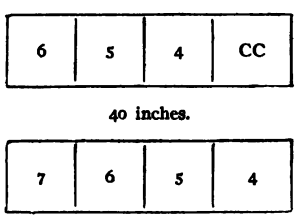
Movements prescribed for a gun squad apply, with obvious modifications, to a caisson, driver, or mechanic squad.

650. Each **driver squad** of the gun and caisson sections consists of a **caisson corporal**, the six



drivers of the carriages of the section, and an extra cannoneer, No. 8, who is trained as a spare driver.

651. Each gun squad is formed in double rank as follows: The gunner and Nos. 2, 4, and 6 in the front rank in order from right to left; Nos. 1,

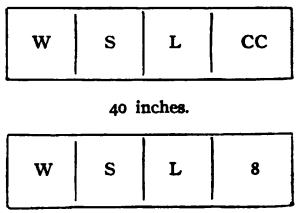


3, 5, and 7 in the rear rank, in order from right to left; No. 1 covering the gunner.

652. Each caisson squad is formed in double rank as follows: The caisson corporal and Nos. 4, 5, and 6 of the first caisson in the front rank in

order from right to left; Nos. 4, 5, 6, and 7 of the second caisson in the rear rank, in order from right to left; No. 4 covering the caisson corporal.

653. Each driver squad is formed in double rank as follows: The caisson corporal is on the right of the front rank; the lead, swing, and wheel drivers of the piece in a gun section, or of the first caisson in a caisson section, are on the left of the caisson corporal in order from right to left; the lead, swing, and wheel drivers of the caisson in a gun section, or of the second caisson in a caisson section, are in the rear rank in order from right to left covering the drivers of the



front rank; the spare driver, No. 8, is in the rear rank covering the caisson corporal.

The driver squad of the ninth section is similarly formed, the spare lead and spare wheel drivers taking, respectively, the places prescribed for the caisson corporal and No. 8.

654. In the fifth section the driver squad is formed with the telephone corporal of the battery commander's detail as its corporal; the scout corporals and the signal privates of that detail fall in as file closers of the section.

655. The mechanic squad is formed in double rank as follows: In the front rank the chief mechanic is on the right and three of the mechanics

are on his left; in the rear rank, covering the men in the front rank, are the four remaining mechanics.

656. In a battery on a peace footing the spare cannoneers assigned to the ninth section constitute a squad, which forms on the left of the driver squad.

657. At dismounted formations, if a squad contains less than six men, it is increased to that number by transfers from other squads, or is broken up and its members assigned to other squads and posted in the line of file closers.

When a squad consists of six men, both of the interior files are blank; when of seven men, one such file is blank.

658. A **platoon dismounted** consists of one lieutenant, who is **chief of platoon,** and two sections dismounted.

The platoon dismounted is formed in double rank, with the sections arranged from right to left in the order of their permanent numbers.

659. A **battery dismounted** comprises the personnel shown in detail in Tables of Organization I and II, Infantry Drill Regulations, 1911.

660. The battery dismounted is formed in double rank with the platoons arranged from right to left in the order of their permanent numbers.

The senior lieutenant is, at formations and exercises of the battery dismounted, assigned as chief of the first platoon. The lieutenant next in rank is assigned as chief of the second platoon, and so on.

Chiefs of platoon and section supervise the movements of their units.

661. When only a part of the battery is formed for dismounted instruction, the word **section** or **platoon,** as the case may be, is substituted in the commands for **battery.**

Posts of Officers, Noncommissioned Officers, etc.

IN LINE

662. The captain: Four yards in front of the center of the battery.

Chiefs of platoon: Two yards in front of the center of their platoons.

The fourth lieutenant, when there are but three platoons: In the line of file closers, opposite the center of the battery.

The first sergeant: In the front rank, 1 yard from the right of the first section.

The quartermaster sergeant: In the front rank, 1 yard from the left of the left section.

The mess and stable sergeants: In the line of file closers of the ninth section.

Chiefs of section: One yard in front of the center of their sections.

Corporals: The right man of the front rank of their squads, except the scout corporals, who are in the line of file closers of the fifth section.

The guidon and the musicians: In the line of file closers of the first section.

Other men for whom there is no place in the squads: In the line of file closers in rear of the section to which they belong or are attached.

IN COLUMN OF SQUADS

663. The captain: Four yards from the flank, opposite the center, on the left (right) when the first (ninth) section is in front.

Chiefs of platoon: On the same side as the captain, 2 yards from the flank and opposite the center of their platoons.

The fourth lieutenant, when there are but three platoons: On the side opposite the captain, 2

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yards from the flank and opposite the center of the column.

The first sergeant: Either 40 inches in front of the guiding file of the leading squad or 40 inches in rear of the guiding file of the rear squad, according as the column has been formed by executing squads right or squads left from line.

The quartermaster sergeant: Either 40 inches in rear of the guiding file of the rear squad or 40 inches in front of the guiding fiile of the leading squad, according as the column has been formed by executing squads right or squads left from line.

Chiefs of section: On the same side as the captain and 4 inches from the flank man of the front rank of the rear squad of their section.

The file closers: On the side opposite the captain and abreast of and 4 inches from the flank of the squad in rear of which they are posted in line.

Maneuvers of the Battery

GENERAL PROVISIONS

664. The maneuvers of the battery dismounted are limited to those necessary for its orderly handling. They are also valuable for fixing the attention of the men and for teaching habits of discipline and prompt obedience. They conform in general to those prescribed in Infantry Drill Regulations for the company.

Preliminary Exercises of the Gun Squads—Formation of the Gun Squads

TO FORM THE GUN SQUADS

665. The instructor indicates the place of formation and commands: **FALL IN.**

Each gunner repeats the command and hastens to place himself, faced to the front, where the right of his squad is to rest.

The cannoneers move at double time and take their places.

666. The place of formation is indicated and the command given thus, for example: 1. **In front (rear) of your pieces (caissons)**; or, 1. **On the right (left) of your pieces (caissons) facing them**; or, 1. **On the road facing the park**, 2. **FALL IN.**

667. In case the front or rear of the carriages is designated, each squad falls in at its post.

668. For the first formation of the gun squads for any drill or exercise the instructor cautions **as gun squads** before giving the command.

TO TELL OFF THE SQUADS

669. CALL OFF. In each gun squad (651) the cannoneer on the right of the rear rank calls off **one**; the cannoneer on the left of the gunner, **two**; the cannoneer on the left of No. 1, **three**; and so on.

The gunner does not call off.

In each caisson squad (652) the cannoneers of the front rank call off first, thus: **four, five, six,** in order from right to left, followed by the cannoneers of the rear rank in the same order. The caisson corporal does not call off.

After having called off, if a subsequent formation is ordered, the cannoneers fall in at once in their proper order.

Posts of Gun Squads and Cannoneers; Mounting and Dismounting

POSTS OF THE GUN SQUADS, CARRIAGES LIMBERED

670. In front of the pieces or caissons: Each squad is in line facing to the front, its rear and center 2 yards from the end of the pole or from the heads of the lead horses.

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671. **In rear of the pieces or caissons:** Each squad is in line facing to the front, its front and center 2 yards from the muzzle or from the rear of the caisson.

672. If no special place of formation is designated, each squad, when formed at the carriages, is posted in front of the leading carriage of its section.

TO POST THE GUN SQUADS

673. The squads are marched to the park, and, on arrival near the carriages, the instructor commands: **Squads in front (rear) of your pieces (caissons).**

Each gunner marches his squad to its carriage and posts it in the indicated position.

674. The instructor habitually causes the squads to approach the front (rear) of the carriages which he designates in his command, from the right of the park if left in front and from the left if right in front.

POSTS OF THE CANNONEERS, CARRIAGES LIMBERED

675. The gunner and No. 1 opposite the rear of the limber wheels of the piece.

Nos. 2 and 3 opposite the rear of the gun wheels.

Nos. 4 and 5 opposite the rear of the caisson wheels.

Nos. 6 and 7 opposite the rear of the limber wheels of the caisson.

The gunner and even numbers are on the right, the odd numbers on the left, all 2 feet outside the wheels, facing the front.

TO POST THE CANNONEERS

676. 1. **Cannoneers,** 2. **POSTS.** Each gunner repeats the command **posts.** The cannoneers leave

the ranks, if formed, and move at double time by the shortest practicable routes to their posts.

677. For preliminary instruction the squads, on entering the park, are first posted with their carriages; the cannoneers are then sent to their posts by the foregoing command. The command is general, however, and is applicable when the cannoneers are in or out of ranks, at a halt or marching, and when the carriages are limbered or unlimbered.

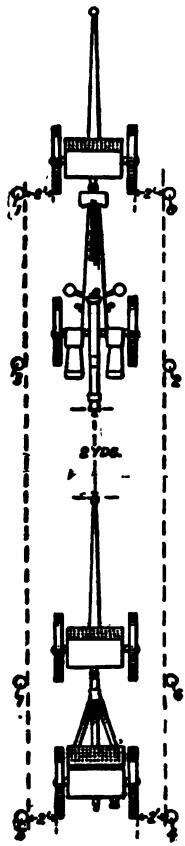

Plate 34 (par. 675).

TO MOUNT THE CANNONEERS ON THE CARRIAGES LIMBERED

678. In each squad the gunner and No. 1 mount on the limber chest of the piece.

Nos. 2 and 3 mount on the axle seats.

Nos. 4 and 5 mount on the caisson chest.

Nos. 6 and 7 mount on the limber chest of the caisson.

When extra cannoneers are present:

No. 8 mounts between Nos. 6 and 7.

No. 9 mounts between Nos. 4 and 5.

The gunner and even numbers mount on the right side of their respective carriages, odd numbers on the left.

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679. 1. Cannoneers, prepare to mount, 2. MOUNT.

At the first command the cannoneers who mount on the limber chests or axle seats hasten to the rear of the limber chests or axle seats; those who mount on the caisson chest hasten to the front of that chest. Each cannoneer who mounts on the limber chest places the foot nearest the wheel on the step, grasps the chest handle with the hand nearest the wheel, and with the other hand grasps the hand of the cannoneer opposite him.

Each cannoneer who mounts on the caisson chest places the foot nearest the wheel on the step, and grasps the chest handle with the hand nearest the wheel. Cannoneers who mount on the axle seats place the foot nearest the wheel on the brake beam, and grasp the seat handle with the hand nearest the wheel.

At the command **mount**, all spring up and seat themselves, those on the chests facing to the front, those on the axle seats to the rear. Those who mount on the limber chests place the foot farthest from the wheel on the top of the limber chest, and then step down on the footboard.

680. If the command be: 1. **Cannoneers, 2. MOUNT,** the cannoneers execute, at the command **mount**, all that has been prescribed for the commands **prepare to mount** and **mount.**

TO DISMOUNT THE CANNONEERS FROM THE CARRIAGES

681. 1. Cannoneers, prepare to dismount, 2. DISMOUNT.

The cannoneers on the chests stand up on the footboards at the first command; at the second command all the cannoneers jump to the ground and take their posts at the double time.

682. If the command be: 1. **Cannoneers,** 2. **DISMOUNT,** they execute, at the command **dismount,** all that has been prescribed for the commands **prepare to dismount** and **dismount.**

POSTS OF THE CANNONEERS, CARRIAGES UNLIMBERED BUT NOT PREPARED FOR ACTION

683. In each squad the gunner immediately in rear of the cannoneer's seat, on the left side of the trail of the gun.

No. 1, immediately in rear of the cannoneer's seat, on the right side of the trail of the gun.

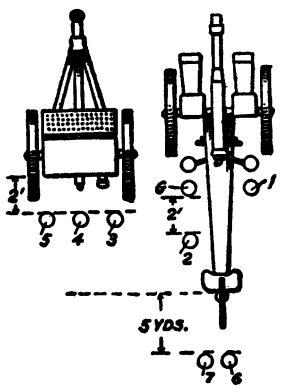

Plate 35 (par. 683).

No. 2, 2 feet in rear of the gunner, covering him.

Nos. 3, 4, and 5, 2 feet in rear of the caisson chest in the order named from right to left.

Nos. 6 and 7, abreast and in order from right to left, 5 yards in rear of the trail spade.

Higher-numbered cannoneers, if present, accompany the limbers. The cannoneers stand at attention at their posts, facing to the front.

TO CHANGE THE POSTS OF THE CANNONEERS

684. In order to exercise the cannoneers in all duties connected with the service of the piece, to vary the drill, and to fix the attention of the men the posts of the cannoneers are frequently changed.

685. The cannoneers being at their posts, carriages limbered or unlimbered: 1. **Change posts,** 2. **MARCH.**

In each squad No. 1 quickly takes the post of No. 2, No. 2 of No. 3, No. 3 of No. 4, No. 4 of No. 5, No. 5 of No. 1. Higher-numbered cannoneers change only when specially directed.

MOVEMENTS OF THE CARRIAGES BY HAND

TO MOVE BY HAND THE CARRIAGES LIMBERED

686. To the front: 1. Pieces (Caissons) forward, 2. MARCH, 3. HALT. In each squad, at the first command, the gunner and No. 1 hasten to the end of the pole; Nos. 2 and 3 to the limber wheels; Nos. 4 and 5 to the rear wheels; higher-numbered cannoneers to the rear of the carriage; the gunner and even numbers working on the right side of the carriage, odd numbers on the left. The cannoneers who work at the pole or at the wheels grasp the same with both hands; those in rear of the carriage prepare to push against the most convenient part of the carriage.

At the command **march,** all assist in moving the carriage to the front. At the command **halt,** the carriage is stopped, the pole is lowered to the ground, and all resume their posts.

687. To the rear: 1. Pieces (Caissons) backward, 2. MARCH, 3. HALT. Executed as in the preceding paragraph, except that at the command **march** the cannoneers move the carriage to the

rear and that the higher-numbered cannoneers place themselves in front of the rear axle of the carriage and push against the most convenient part of the carriage.

Duties of the Cannoneers in Unlimbering

DISPOSITION OF THE CARRIAGES REFORE AND AFTER UNLIMBERING

688. Before unlimbering: The piece and its caisson are placed abreast of each other, 2 yards apart, poles pointing in the same direction. This formation of the carriages is called a **double section.** The interval of 2 yards should not be materially changed, otherwise the amount of movement of the carriages by hand is greatly increased.

689. If it is intended to fire to the front, the caissons should be placed on the left of their pieces before the command for unlimbering is given; if it is intended to fire to the rear, the caissons should be on the right of their pieces; if to the flank, on either side of their pieces. In emergencies the carriages may be unlimbered from any formation. Dispositions to meet various situations should be practiced.

690. When not horsed the carriages are drawn by the cannoneers and the instructor gives the necessary instructions for moving the carriages by the shortest routes into the prescribed positions.

691. After unlimbering: The adjacent wheels of the gun and caisson are about 1 foot apart, the gun muzzle and the caisson trail pointing to the front, the gun on the right and slightly in advance of the caisson.

The gun is placed slightly in advance to allow for recoil at the first shot, which on ordinary ground is about 10 inches.

The interval of 1 foot may be increased to permit wide movements of the trail if they are anticipated, but effort should be made to preserve the protection afforded by the shields.

In emergencies the caissons may be placed temporarily on the right of their pieces. As this position is not favorable to the service of ammunition, the caissons should be placed on the left of their pieces as soon as practicable.

692. In active service and in instruction simulating service conditions, the limbers are placed under cover in the vicinity of the position; if no cover is obtainable in the vicinity, they are placed in line in rear of either flank at such place as the instructor may designate.

To Unlimber—General Rules

693. 1. In unlimbering to fire to the front each caisson establishes the position.

2. In unlimbering to fire to the rear, each piece establishes the position.

3. In unlimbering to fire to the flank, the element (gun or caisson) on the side toward which fire is to be directed establishes the position.

4. If the carriages, after unlimbering, have to be moved by hand to the firing position, all the cannoneers of the gun squad, when the ground is difficult, assist at each carriage in turn in moving it to the designated position.

5. In drills with the carriages not horsed, spare cannoneers or those higher in number than No. 5 are used to move the limbers to the place designated by the instructor.

6. If the carriages are not horsed, they are unlimbered successively, the one which establishes the position being unlimbered first. The limbers are drawn by cannoneers designated by the instructor. Thus, if only the gunner and five cannoneers are present, the cannoneers posted with

the piece may be required to move the limber of the caisson, and those with the caisson, the limber of the piece. If higher-numbered cannoneers are present, however, they are ordinarily used for this purpose.

TO FIRE TO THE FRONT

694. The carriages being in double section the caissons on the left: **ACTION FRONT.** If marching the carriages halt at the command or signal. The cannoneers, if mounted, dismount after the carriages have halted.

The Caissons: Nos. 4 and 5 jump to the trail handles. Nos. 6 and 7, if present, run to the right and left caisson wheels, respectively, and stand ready to assist in such movements of the carriage as may be necessary. No. 4 unlatches the pintle; Nos. 4 and 5 raise the trail from the pintle; and No. 4, by raising his arm, signals for the drivers to drive on; Nos. 4 and 5 then lower the trail to the ground. No. 4 sets the brake, and all the cannoneers at the caisson take their posts.

The Pieces: The gunner and No. 1 jump to the trail handles. No. 2 runs around the muzzle of the gun to the wheel that is to become the right wheel of the piece unlimbered and places himself so as to be ready to turn the top of his wheel toward the trail. No. 3 runs around the muzzle of the gun to the wheel that is to become the left wheel of the piece unlimbered and places himself so as to be ready to turn the top of his wheel toward the muzzle. The gunner unlatches the pintle, and, assisted by No. 1, raises the trail from the pintle. The gunner, by raising his arm, signals for the drivers to drive on. The gunner and No. 1 carry the trail away from the caisson and all of the cannoneers working together turn the piece around 180°. The gunner causes the piece to be placed by the side of the caisson. The gunner

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and No. 1 lower their trail to the ground, and all the cannoneers at the piece take their posts.

Limbers: At the signal **drive on,** the limbers take their prescribed positions. To take posts in rear of the carriages each caisson limber executes a left about, moves straight to the rear, executes another left about, and halts, so that the heads of the lead horses or the end of the pole will be 25 yards from the rear of the caisson. Each piece limber follows the caisson limber, passes around in rear of it, and halts so as to be abreast of it and 2 yards to its right.

In horse batteries, Nos. 6 and 7 do not assist at the caisson.

TO FIRE TO THE REAR

695. The carriages being in double section, the caissons on the right: **ACTION REAR.** If marching, the carriages halt at the command or signal. The cannoneers, if mounted, dismount after the carriages have halted.

The Caisson: Nos. 4 and 5 jump to the trail handles. Nos. 6 and 7, if present, run to the right and left caisson wheels, respectively. No. 6 stands ready to turn the top of his wheel away from the trail, while No. 7 stands ready to turn his toward the trail. No. 4 unlatches the pintle; Nos. 4 and 5 raise the trail from the pintle and No. 4, by raising his arm, signals for the drivers to drive on; Nos. 4 and 5 carry the trail away from the piece and all the cannoneers working together turn the caisson around 180° and place it by the side of the piece; Nos. 4 and 5 lower the trail to the ground. No. 4 sets the brake and all of the cannoneers working on the caisson take their posts.

The Piece: The gunner and No. 1 jump to the trail handles. No. 2 runs around the muzzle of the gun to the wheel that is to become the right wheel of the piece unlimbered, and stands ready

to assist in such movements of the carriage as may be necessary. No. 3 runs around the muzzle of the gun to the wheel that is to become the left wheel of the piece unlimbered, and stands ready to assist in such movements of the carriage as may be necessary. The gunner unlatches the pintle and, assisted by No. 1, raises the trail from the pintle. The gunner, by raising his arm, signals for the drivers to drive on. The gunner and No. 1 lower the trail to the ground and all the cannoneers at the piece take their posts.

Limbers: To take post in rear of the carriages, each caisson limber inclines well to the right, moves to the rear, executes a left about, and halts so that the heads of the lead horses or the end of the pole will be 25 yards from the rear of the caisson.

Each piece limber follows the caisson limber, passes around in rear of it, and halts so as to be abreast of it and 2 yards to its right.

In horse batteries, or when Nos. 6 and 7 are not present, Nos. 2 and 3 perform the duties prescribed for Nos. 6 and 7, respectively, as soon as the piece trail is lowered to the ground.

TO FIRE TO THE FLANK

696. The caisson being on either side of the piece, 2 yards from and abreast of it: **ACTION RIGHT (LEFT).**

Executed according to the principles of **action front** and **action rear,** with the following modifications: After the carriages are unlimbered, the muzzle of the gun and the trail of the caisson are turned in the direction of fire, and the carriage in rear is run up to its proper position on the line. The carriage on the side toward which fire is to be delivered is first established in position, and then all the cannoneers assist in bringing up the carriage in rear to its proper place.

Limbers: To take post in rear of their carriages, the limbers farthest from the flank toward which fire is to be delivered move out first, wheel away from the direction of fire, and after having gained sufficient distance to the rear execute an about and halt at the prescribed position. The other limbers follow and take position in a similar manner.

DUTIES OF THE CANNONEERS IN LIMBERING

697. The carriages being in position unlimbered and in march order, to limber to the front and rear: 1. **Limber,** 2. **FRONT AND REAR.**

In each squad the gunner and No. 1 face to the rear at their posts. No. 2 places himself on the right of the gunner, facing to the rear. No. 3 jumps across the trail of the piece and places himself on the left of No. 1, facing to the rear. Nos. 4 and 5 hasten to the front of the caisson; No. 4 releases the brake, and both place themselves with their backs toward the chest, close up against the footboards, No. 4 on the right, No. 5 on the left of the trail. No. 6 passes around the right of the piece and places himself on the right of No. 4. No. 7 runs around the left of the caisson and places himself on the left of No. 5.

The limbers are brought up so as to move squarely across the direction of the trails and so that the wheel nearest the trail will pass about a foot outside of the lunette.

When the axle of the piece limber is nearly in line with the trail, the gunner commands: 1. **Limber,** 2. **HALT.** The limber halts and is then swung around and again halted so that the pole is pointing in the direction of the trail and so that the pintle is almost over the lunette. As soon as the limber has halted in this position, the gunner and No. 1 spring to the trail handles and raise the trail. Nos. 2 and 3 jump to the gun wheels and prepare to assist in any movements of the car-

riage that may be necessary. The gunner and No. 1 place the lunette over the pintle; the gunner latches the pintle.

The caisson is limbered in the same manner, No. 4 giving the commands for halting the limber; Nos. 4 and 5 handling the trail; No. 4 latching the pintle; Nos. 6 and 7 assisting by working on the wheels in any movements of the carriage.

All the cannoneers take their posts at the carriages limbered.

698. To the rear: 1. **Limber,** 2. **REAR.**

No. 4 releases the brake. The caisson is turned around 180°; Nos. 4 and 5 carrying the trail away from the piece. Nos. 1 and 6 turn the top of their wheel toward the trail; Nos. 3 and 7 turn the top of their wheel away from the trail; the gunner and No. 2 assist by pulling and pushing on the chest. The caisson having been turned, all the cannoneers working together run the caisson 20 yards straight to the rear of the line of guns. Nos. 4 and 5 lower the trail and all the cannoneers take their posts for limbering. The limbers are brought up and the limbering is completed as described above.

The Soldier Mounted

699. The efficiency of field artillery depends so largely on the riding of the men, and on the care, training, management, and condition of the horses that the maintenance of a high standard of horsemanship must be the aim of all commanders.

For field artillery officers, skill in the actual riding and management of the horse is a most desirable accomplishment to which some are better adapted and in which they become more expert than others, but a thorough understanding of the care, management, and conditioning of horses, the ability to train or direct the training of remounts, are essential qualifications.

For field artillery soldiers the same training and qualifications in horsemanship are required as for the cavalry soldier as given in the School of the Trooper, Mounted, on pages 138 and 139. In addition, if a driver—

(a) He should be able to drive a pair of horses in any position in a team and make them do even work in draft without distressing or fretting them.

(b) He should thoroughly understand the care and fitting of harness.

Complete and detailed instructions in saddling, bridling, harnessing, elementary training in equitation and horsemanship, the gun squad mounted, and in driving are given in Part III, Volume I, Provisional Drill and Service Regulations for Field Artillery (Horse and Light), 1916.

The Battery Mounted

Object and sequence of the instruction

700. The special object of this instruction is the training of the personnel of the battery in the dispositions and maneuvers requisite for getting the guns into position for action.

701. On the ordinary drill ground the battery is practiced in maneuvering and in fire discipline so that the details of each are thoroughly understood and well performed by the personnel of the battery and so that the various units of the battery work together smoothly and effectively under the direction of the captain. Opportunities should then be sought for practice over all available kinds of ground to the end that the personnel may become accustomed to adapting the principles learned on the drill ground to the accidents of a varied terrain.

Frequent practice should be had in the selection of observing stations, the reconnaissance of tar-

gets, the selection of firing positions, advancing to and occupying firing positions, under different conditions, the determination of firing data for direct and indirect laying at fixed and moving targets, simulated fire, etc. This practice should approximate the conditions of war as nearly as possible.

General Provisions

702. All men of the battery should be instructed in the duties of both the cannoneer and driver.

703. In order that all the horses may be available in an emergency for any place in the battery, the team horses should be taught to work in the lead, swing and wheel pairs; and on both the off and near sides. Saddle horses should occasionally be worked in harness, and team horses used as saddle horses.

704. A **gun section** consists of a gun and its caisson, manned, horsed and equipped.

A **caisson section** consists of two caissons, manned, horsed, and equipped.

The leading caisson of each caisson section in the normal order in park is called the **first caisson**; the other is called the **second caisson.** What is prescribed in the text for pieces and caissons of gun sections applies, with obvious modifications, to first and second caissons of caisson sections, respectively.

705. The captain, lieutenants, sergeants, caisson corporals, chief mechanic, horseshoer, mechanics, drivers, guidon, and musicians are mounted. The necessary privates for the scout and signal details should also be mounted.

The cannoneers are on foot or mounted on the carriages, at the discretion of the captain; they are not ordered to mount or dismount when the battery is marching at a trot or gallop.

On the march in the field the cannoneers are usually mounted on the chests, axle seats, and off horses, for rapid movements only.

In horse batteries everyone is mounted; the cannoneers, except the horse holders, dismount to serve the guns.

Formations of the Battery

706. The habitual formations are the **order in line,** the **order in section column,** the **order in flank column,** and the **order in battery.**

707. The **order in line** is that in which the sections of the battery are formed abreast of each other in the order, or the reverse order, of their numbers from right to left. The carriages are limbered, and in each section are in section column, the pieces being either in front or in rear of their caissons.

In the normal order in park the pieces are usually in front.

If the carriages of each section are in double section, the formation is called a **double-section line.**

708. The **order in section column** is that in which the sections of the battery follow each other in the order, or the reverse order, of their numbers, from front to rear. The carriages are limbered, and in each section are in flank column, the pieces being either in front or in rear of their caissons.

If the carriage of each section are in double section, the formation is called a **double-section column.**

709. The **order in flank column** is that in which the sections of the battery follow each other in the order, or the reverse order, of their numbers, from front to rear. The carriages are limbered, and in each section are in flank column, the cais-

sons being all either on the right or the left of their pieces.

710. The **order in battery** is that in which the pieces and caissons of the gun sections, unlimbered for action, are placed in line in the order, or the reverse order, of their numbers, from right to left; the caissons of the fifth section, unlimbered, one on each flank of the line; and the limbers either in rear of their unlimbered carriages, or formed at such other place as the captain may direct.

The reserve, consisting of such other caissons, etc., as may be present, is posted at the discretion of the captain.

711. In line and in flank column, the normal interval between carriages, measured between adjacent wheels, is 17 yards.

In the order in battery, the interval is the same, but is measured between adjacent wheels of gun carriages.

712. In column or in line, the distance between two carriages or between a carriage and a mounted squad is 2 yards, except that in flank column the distance between caissons is 4 yards; and in line, when the pieces lead, the distance between caissons of the caisson sections is 4 yards. In battery, when the limbers take post in rear of their carriages, the distance between the line of pieces and the limbers is 25 yards, measured from the rear of the caissons to the heads of the lead horses.

713. When the teams have but two pairs of horses, the intervals are diminished 3 yards; should the teams have four pairs, the intervals are increased 3 yards.

If any carriage has lost one pair of horses or more, it has the same position as if the team were complete.

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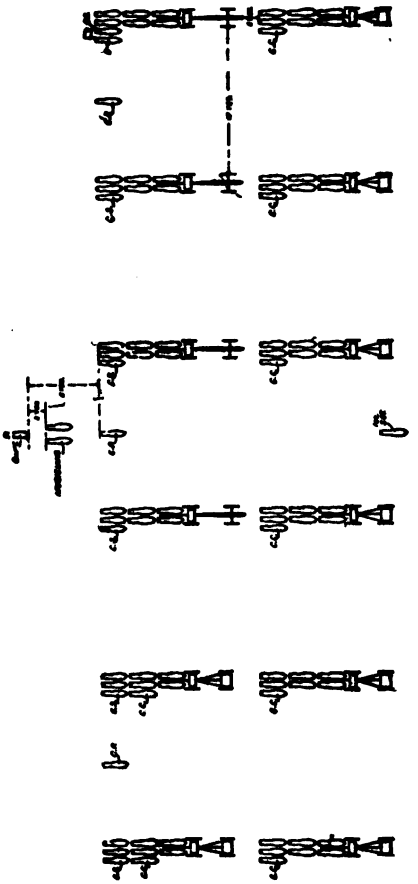

Plate 36 (par. 707). Order in Line.

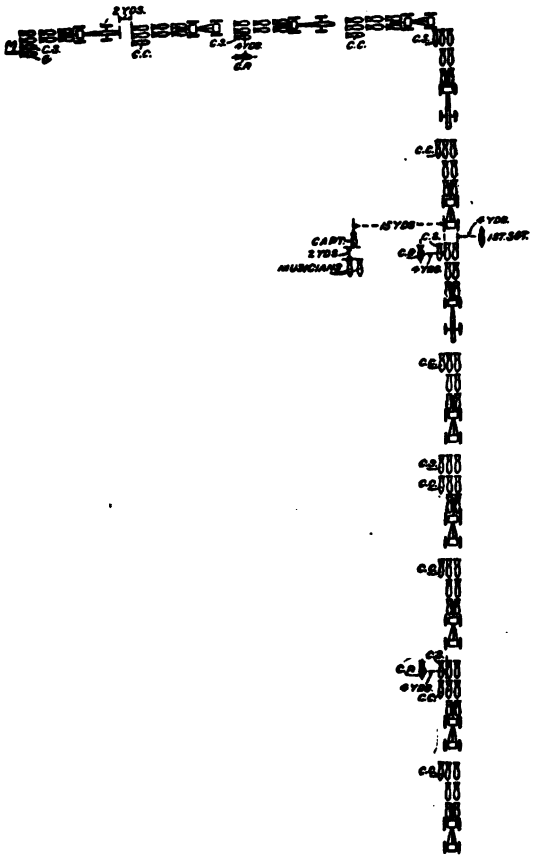

Plate 37 (par. 708). Order in Section Column.

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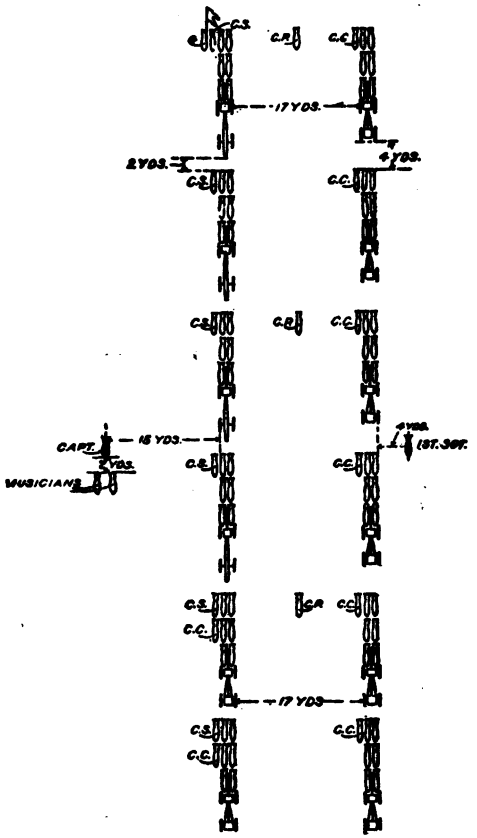

Plate 38 (par. 709). Order in Flank Column.

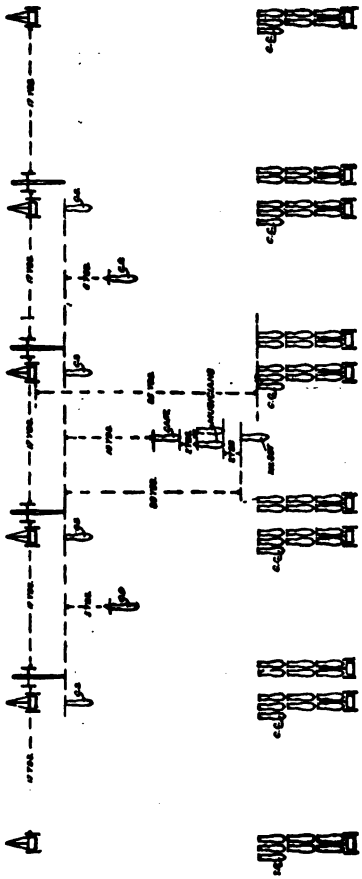

Plate 39 (par. 710). Order in Battery.

Firing Instruction

Object and sequence of the instruction

714. The objects of this instruction are:

1. To train the personnel in the mechanism of the methods of fire so that, at the word of command, fire of the desired nature may be delivered with certainty and celerity. **(Fire discipline.)**

2. To train officers and their assistants so that they may utilize the weapons at their disposal to the best advantage. **(Conduct of fire.)**

715. A progressive order of instruction should be followed in each case.

Training in the elementary duties of the two kinds should be undertaken separately at first. Drill in the mechanism of fire is the essential feature of instruction of the first kind; practice in determining firing data and in adjusting fire under various assumed conditions the essential feature of instruction of the second kind.

716. All officers and men should receive training in fire discipline. It begins with the instruction of the **cannoneer,** passes to that of the **gun squad,** then to that of the **firing battery,** and then to that of the higher units.

The cannoneer must be taught to perform quickly and correctly the individual duties required of him in the service of the piece. He must acquire such a thorough knowledge of these duties and such a well-grounded habit of performing them properly that the service of the piece will not be affected by the excitement of action.

The gun squad must be trained as a unit, so that its individual members work together smoothly, quietly, and effectively in serving the piece.

The instruction of the firing battery and of the higher units should secure the harmonious working of the organization in delivering fire.

717. The individual must be taught the care and the accurate and rapid use of the instruments supplied for observation and communication and must learn to put into practice the principles underlying observation of fire and its adjustment to secure effect.

The combined personnel must be trained so that individuals work together smoothly and effectually in obtaining accurate and useful information and in its correct application and transmission.

Instruction in Matériel

718. The instruction begins with the first drills of the cannoneer, and is carried on during the intervals of more advanced work. It is usually conducted in the park and should be practical in its nature, involving a careful and painstaking description, supplemented by actual demonstration of the method of operation of the particular element of the matériel being described. It is continued until there is acquired an intimate knowledge of the matériel in use in the battery, embracing such subjects as the following:

1. Nomenclature of the principal parts of the piece and caisson.
2. Purpose and operation of the different parts of the gun and carriages; for example, the application of the brakes.
3. Description and use of sights and quadrants, their attachment and manipulation.
4. Kinds of projectiles and the special uses of each.
5. Name and objects of the principal parts of fuzes and fuze setters, and their mode of operation.
6. Disassembling and assembling those parts of the matériel which frequently require cleaning and repair.
7. Transferring sights and quadrants between their traveling and firing positions.

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8. Names of tools and accessories, where they are carried, and how they are used.

Duties in Detail of the Gunner

719. The duties of the gunner in the service of the piece are:

1. To set the deflection.
2. To apply the deflection difference.
3. To set the range.
4. To level the cross-level bubble on the sight-shank socket.
5. To give the direction to the piece.
6. To give the elevation in direct laying.
7. To call **ready.**
8. To move his head out of the way of the sight before the piece is fired.
9. To give the command to fire the piece.
10. To measure a deflection.

The Deflection

720. The deflection is the horizontal angle between the line of sight and the axis of the bore. There are two sights—the panoramic sight and the peep sight. The panoramic sight is habitually used except in fire at will.

721. The panoramic sight is so constructed that any horizontal angle can be laid off by it, and that by changing its setting the gunner can look in any horizontal direction. The sight has two scales. The limb of the instrument is divided into 64 equal parts. The even-numbered divisions are marked in figures. The smaller scale on the left side of the body of the instrument is divided into 100 equal parts, and is called the micrometer. A complete turn of the micrometer changes the reading of the limb by one division. The complete circumference is, by this arrangement, divided into 6,400 equal parts, and the **least reading** is one of these parts, called a **mil.** A deflection of 1 **mil**

corresponds to a deviation at the objective of one one-thousandth of the range. Hence a difference of 1 mil in deflection is equivalent to 1 yard in direction at 1,000 yards from the gun, to 1½ yards at 1,500 yards, and so on.

When the panoramic sight is set at zero the vertical plane through the line of sight is parallel to the axis of the bore.

722. To set off a deflection on the panoramic sight: The gunner turns the rotating head of the instrument until the number of hundreds of the setting is shown by the index of the limb and the number of ten and units, if any, by the index of the micrometer.

If, in setting the deflection, the rotating head of the instrument has to be moved through a small angle only, the slow-motion screw is used. But if the reading given requires a large angular movement, the slow-motion mechanism is ungeared and the rotating head is turned around to the approximate position by hand. The slow-motion mechanism is then thrown in gear and used to set off the exact setting.

723. The gunner is practiced in setting deflections on the panoramic sight by command. Thus, for example: **Deflection, 1640.**

The gunner brings the index of the limb between the divisions marked "16" and "17" on the limb, then turns the micrometer until its index reads 40.

724. The graduations on the deflection scale of the peep sight correspond to those on the panoramic sight, the unit of the scale being 1 mil. When set at 0 (6,400) the vertical plane through the line of sight is parallel to the axis of the bore. Toward the left the readings increase, the maximum reading being 45 mils; toward the right the readings decrease, the minimum reading being 6,355 mils.

To set off a deflection on the peep sight: The gunner turns the peep-sight screw head with his left hand until the index is opposite the desired graduation.

725. To throw the projectile to the left, increase the deflection. To throw the projectile to the right, diminish the deflection.

The captain changes the direction by commanding: **Right (Left) (So much).** The command **Right (Left)** indicates the direction in which the captain wishes to throw the projectile.

The gunner is practiced in setting off a new deflection. Thus, the reading being 1620, **Left 20,** the gunner at once sets 1640.

THE DEFLECTION DIFFERENCE

726. The training of the gunner in applying the deflection difference is begun when he is expert in setting off the deflection.

THE RANGE

727. The range of a target is the distance in yards from the gun to the target.

728. The range scale on the sight shank is graduated from **100** to **6,500** yards, the least reading being 50 yards. The scale may be readily set by eye to read to 25 yards.

To set off a range on the sight shank: The gunner moves the sight shank up or down in its socket until the desired graduation is opposite the index. In setting the range he is careful to lower his head so as to look squarely at the scale and the index.

The sight shank is moved up or down by means of a scroll gear operated with the right hand. If a considerable movement of the shank is necessary this mechanism is ungeared by drawing outward the scroll-gear handle with the right hand; the

shank is then raised or lowered with the left hand until the desired graduation is near the index. The scroll-gear mechanism is then thrown in gear and utilized to set the scale at the exact setting desired.

729. The gunner is practiced in setting the sight for range, thus: The sight shank being in its socket, the instructor commands, for example, **2700.**

The gunner sets the sight as just described and the instructor verifies the setting.

THE CROSS LEVEL

730. To center the bubble of the cross level: The gunner, with his left hand, turns the leveling screw on the sight-shank socket until the bubble is centered.

The centering of this bubble is necessary to avoid errors in the direction of the gun due to a difference in level of the gun wheels.

THE DIRECTION

731. To give the direction to the piece: The gunner traverses the piece on the carriage until the vertical cross hair of his panoramic sight is on the target or the aiming point. He habitually operates the traversing gear with his left hand. When he finds that he cannot traverse the piece sufficiently to bring the vertical cross hair on the aiming point or target, he commands: **Muzzle right (left).** Immediately upon giving this command the gunner brings his piece back to the center of traverse, except that in the case of fire at moving targets the muzzle of the gun is moved as far as it will go in the direction opposed to that of the motion of the target.

732. The gunner is practiced in the manipulation of the traversing gear and in bringing the

vertical cross hair accurately on the aiming point. He must form the habit of turning the traversing handwheel in a clockwise direction to throw the cross wires to the left, and vice versa. He must also form the habit of bringing the gun to the center of traverse whenever it is necessary to shift the trail.

733. When the gunner gives the direction **only,** the method of laying is **indirect.** The signal that **indirect laying** is to be used is the command: **Aiming point (So and so).**

734. The gunner is practiced in his duties of laying for direction **only** as follows:

The gunner being seated on his trail seat at the piece unlimbered, the sights in their sockets, the bubble of the cross level centered, and the piece at the center of its traverse, the instructor commands, for example:

1. **Aiming point, the chimney on that white house.**
2. **Deflection, 240.**
3. **2400.**

1. At the command for the deflection the gunner sets it off on his panoramic sight.
2. Sets off, **approximately,** the range announced.
3. Looks at the cross level and centers the bubble, if necessary.
4. Looks through the sight and operates the traversing mechanism so as to bring the vertical cross hair on the aiming point.
5. Calls **ready** when he has laid the gun accurately for direction.

The gunner takes care not to touch the elevating gear in this method of laying. The approximate elevation is given by the instructor or an assistant. The chief of section causes the trail to be shifted until, when the gunner has set off the deflection, a side face of the rotating head of the sight is in line with the aiming point.

If the piece has been laid for a given deflection, the instructor may command, for example: **Right (left), 20.**

The gunner applies the correction to the old deflection and lays the piece as explained above.

THE ELEVATION

735. **To give the elevation to the piece,** the gunner turns the elevating handle until the horizontal cross hair is on the **bottom** of the target.

The gunner is practiced in the manipulation of the elevating gear. He must form the habit of turning the handle in a clockwise direction to increase the elevation and, therefore, the range and vice versa.

736. When the gunner gives both the direction and the elevation, the method of laying is **direct.** The signal that **direct laying** is to be used is the command **Target (So and so).**

737. The gunner is practiced in the duty of laying for both direction and range as follows:

The gunner, being seated on his trail seat at the piece unlimbered, the sights in their sockets, the bubble of the cross level centered, the piece at the center of its traverse, the instructor commands, for example:

1. **Target, that gun.**
2. **Deflection, 10.**
3. **2400.**

At the indication of the target an assistant gives the piece the general direction under the supervision of the chief of section.

As the commands are given the gunner—

1. Sets off the deflection ordered.
2. Sets off the range ordered.
3. Centers the cross level bubble, if necessary.
4. Looks through the sight and operates the traversing and elevating mechanism so as to bring the line of sight on the bottom of the target.

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5. Calls **ready** when the gun is accurately laid.

738. Whatever the method of laying, the gunner must always see that the gun is at the **center** of its traverse whenever it is necessary to shift the trail, except when firing at moving targets. This centering of the gun in its traverse and the accurate establishment of the general direction avoid frequent shifting of the trail and consequent loss of time which would otherwise result.

THE READY

739. The call **ready** by the gunner indicates to the chief of section that the piece is accurately laid and is ready to fire.

TO AVOID INJURY

740. Unless the gunner is careful **to move his head out of the way of the sight** before the gun is fired, the shock of discharge may bring the sight against his eye with sufficient force to injure it.

THE COMMAND TO FIRE

741. The gunner invariably gives or repeats the command **fire** in actual or simulated firing, so as to insure his piece being fired at the proper time.

TO MEASURE A DEFLECTION

742. The gun being established in direction by direct laying or otherwise, the deflection may be measured by turning the rotating head of the panoramic sight until the vertical cross hair is on the aiming point. The reading of the instrument is then the deflection sought.

743. The gunner is practiced in measuring the deflection as follows:

The gun being laid in direction on any target with zero deflection and the gunner seated on his trail seat, the instructor commands, for example:

1. **Aiming point, that clock tower.**
2. **MEASURE THE DEFLECTION.**

1. The gunner turns the rotating head of the panoramic sight until the vertical cross hair is on the designated aiming point.
2. He then reads and announces the deflection, thus: **Deflection, 490.**

Duties in Detail of No. 1

744. The duties of No. 1 in the service of the piece are:

1. To set and release the brake.
2. To open the breech.
3. To set the site on the quadrant.
4. To set the range on the quadrant.
5. To center the cross level bubble of the quadrant.
6. To close the breech.
7. In indirect laying, to give the elevation.
8. To call **set.**
9. To fire the piece.
10. To measure the site.

THE BRAKE

745. To set the brake, No. 1 grasps the brake-lever handle, pulls the lever down until the brake shoes come firmly against the wheels, and then swings the handle in until the lever engages in the rack.

746. To release the brake, No. 1 grasps the handle and pulls the lever so as to tighten the brake somewhat and so enable him to release the lever from the rack by throwing the handle to one side. Having released the lever from the rack, he pushes the handle up until the brake shoes are well away from the wheels.

747. No. 1 sets the brake as soon as the piece has been given the general direction. Whenever the trail has to be shifted No. 1 releases the brake

and sets it again as soon as the trail has been re-established.

THE BREECH

748. To open the breech, No. 1 grasps the operating lever with his left hand and compresses the lever latch. He then draws the lever to the rear and right, thus swinging the block to the right. The lever should be drawn sharply so as to give the ejector sufficient force to throw the cartridge case clear of the gun.

749. No. 1 opens the breech as soon as the gun is in position and prepared for action and keeps it open at all times, except when the piece is loaded, until the command for march order or limbering is given, when he closes it. He is careful to see that the block remains fully away from the breech so that it will not interfere with loading.

In opening the breech after firing the piece, No. 1 half rises from his seat and, leaning to the rear, opens the breech as the piece returns into battery.

TO MEASURE THE SITE

750. The gun is first laid directly on the target by the gunner, who sets the sight shank at any convenient range, the deflection at zero, and brings both the cross hairs on the target by traversing and elevating the piece. No. 1 then sets the range disk of the quadrant at the same range as that on the sight shank and centers the bubble of the elevation level by turning the micrometer screw. The site reading is the site of the target.

751. On the right side of the body of the quadrant is the level scale the divisions of which are marked 2, 3, 4, and 5. Above the level scale at the upper end of the micrometer screw is the level micrometer scale which is divided into 100 equal parts. The site is set off on these scales. A complete turn of the micrometer changes the read-

ing of the level scale by one division. One division on the micrometer is one mil; one division on the level scale is therefore 100 mils and its graduated divisions are called 200, 300, etc. Three hundred corresponds to targets at the level of the gun; below 300 corresponds to targets below the gun; and above 300 to those above the gun.

752. To set off the site, No. 1, with his right hand, turns the micrometer screw until the number of hundreds of the setting is shown by the level index and the number of tens and units is shown by the index of the micrometer. It is necessary in setting the site that No. 1, after setting the level scale, place his head so as to look squarely down on the micrometer. He must form the habit of moving the micrometer scale in a clockwise direction to increase the site setting, in a counterclockwise direction to diminish the setting.

753. No. 1 is practiced in setting sites by command.

The quadrant being in its socket, the instructor commands, for example: **Site, 315.**

No. 1 turns the micrometer screw until the index of the level scale is between the graduation marked **3** and the graduation marked **4,** and the index of the micrometer reads **15.**

THE RANGE

754. In indirect laying the range is set off on the range disk of the quadrant. The range disk is graduated from zero to 6,500 yards. The least reading on the scale is 50 yards, but the range may readily be set by eye to a least reading of 25 yards.

755. To set off a range, No. 1 turns the scroll gear handle with the left hand until the index is opposite the designated range. In setting a range,

it is important that No. 1 place his head so that his eye will be squarely opposite the range scale.

If it is necessary to make a considerable change of reading, the slow-motion mechanism is ungeared by drawing out the handle. By pushing up or down, the scale is moved until it is near the desired setting. The tension on the handle is then released and the slow-motion mechanism is thrown into gear and used to effect an accurate setting.

756. No. 1 is practiced in setting ranges by command.

The quadrant being in or out of its seat the instructor commands, for example: **2550.** No. 1 manipulates the handle with his left hand until the index is brought opposite the designated reading.

THE CROSS LEVEL

757. To center the bubble of the cross level, No. 1 turns the cross level screw with the right hand. The centering of this bubble is necessary in order to avoid errors in the elevation of the piece due to a difference in level of the gun wheels. No. 1 is careful to keep the cross bubble centered at all times.

THE BREECH

758. To close the breech, No. 1 places the middle of the palm of his open left hand against the operating lever, pushes the lever to the left, and swings the block smartly to its seat.

THE ELEVATION

759. When the quadrant is set and the elevation is given by No. 1 the laying is said to be **indirect.**

The signal that indirect laying is to be used is the command: **Aiming point (So and so).**

The signal that direct laying is to be used and that consequently No. 1 is not to set the quadrant or give the elevation is the command: **Target (So and so).**

In direct laying No. 1 must be careful not to touch the elevating mechanism.

760. To give the elevation to the piece, No. 1 operates the elevating handle until the bubble of the elevation level is centered.

Turning the elevating handle clockwise moves the bubble to the front and increases the elevation and the range, and vice versa.

It is important that this become second nature to No. 1.

761. No. 1 may be practiced in his duties of laying for elevation as follows:

No. 1 being seated on his trail seat, at the piece unlimbered, the quadrant in its seat and the cross level bubble centered, the instructor commands, for example:

1. **Site 280.**
2. **3400.**

1. At the command for the site No. 1 sets it off with his right hand.
2. Sets the range with his left hand.
3. Centers the cross level bubble, if necessary.
4. Centers the bubble of the elevation by turning the elevating handle with his right hand.
5. Calls **set** when he has laid the piece accurately for elevation.

THE SET

762. The call **set** by No. 1 indicates that so far as he is concerned the piece is accurately laid.

As soon as he calls **set** No. 1 grasps the firing handle with the left hand.

When the chief of section cautions **with the lanyard,** No. 1 attaches the lanyard to the firing mechanism and, after calling set, steps clear of the

wheel, holding the end of the lanyard in his left hand.

TO FIRE

763. To fire the piece, No. 1 at the command of his gunner pushes the firing handle down with his left hand, so as to release the firing pin. It is important that No. 1 form the habit of using only his left hand to fire the gun. This makes it impossible for him to have any part of his body in the way of the gun during recoil.

In firing with the lanyard, No. 1 pulls on the lanyard until the firing pin is released. The lanyard is not used except when the ground is such that the trail spade is not easily seated and then is usually necessary only for the first shot.

DUTIES IN DETAIL OF NO. 2

764. The duties of No. 2 in the service of the piece are:

1. To shift the trail so as to give the general direction to the piece.

2. To throw the empty cartridge cases out of the way of the gun squad.

TO SHIFT THE TRAIL

765. For the assistance of No. 2, the upper edges of the top and main shields should be graduated in mils, and each division of 50 mils should be marked. No. 2 should also be instructed as to the value in mils of the width of the trail spade and of the float.

With the origin at the middle of an upper edge the divisions on the shields should be for the average case with the 3-inch field gun 6, 12, 18.1, and 24.5 inches from the origin to indicate divisions of 50, 100, 150, and 200 mils, respectively. The middle of the top of the tire is approximately 250 mils from the center division.

A shift of the trail by the width of its mark in the ground corresponds to a change of direction of about 150 mils.

A shift of the trail by the width of the float corresponds to a change of direction of about 220 mils.

766. To shift the trail, No. 2 stands immediately in rear of the trail handspike, feet about 18 inches apart, and grasps the handspike with both hands.

767. When the target is visible and direct laying is used, No. 2 sights along the barrel and shifts the trail so as to point the gun directly at the target.

Unless the target is moving it should not be necessary to shift the trail during the firing. In the case of moving targets No. 2, after once pointing the piece at the target, does not shift the trail until he gets the gunner's command: **Muzzle right (left).** He then shifts the trail so as to bring the piece again on the target.

Whenever it is necessary to shift the trail in direct laying, No. 2 watches the gunner and does not complete the shifting of the trail until the gunner has traversed the gun to the center or to one extreme of its movement on the carriage.

768. No. 2 is practiced in pointing the piece directly at the target.

The piece being in position and No. 2 at the trail handspike, the instructor commands, for example:

Target, that house.

No. 2 points the piece quickly on the designated target.

The instructor verifies the pointing with the panoramic sight set at zero deflection.

769. When the piece is laid for direction by the use of an aiming point **(indirect laying),** No. 2 gives the original direction to the piece by shifting the trail in accordance with the commands or

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signals of the chief of section, or of some one representing the chief of section.

To signal to No. 2, the chief of section extends his arm toward the trail, palm of the hand turned and fingers pointing in the direction in which the trail is to be moved. To indicate that the direction is correct and that the trail is to be lowered, the chief of section commands: **Trail down**; the corresponding signal is the bringing of the extended arm sharply to the side.

770. No. 2 is practiced in giving the piece its initial pointing in indirect laying. In these exercises an aiming point is taken, the sight is set at an appropriate reading and the chief of section, looking along a side of the rotating head, causes the gun to be given its proper direction.

No. 2 should also be instructed as to what should be the approximate direction of the piece when the sight, set at different deflections, is directed on an aiming point.

771. After the initial direction has been given, No. 2, in indirect laying, shifts the trail whenever the deflection is changed by 50 mils or more and also whenever he gets the command: **Muzzle right (left).**

No. 2 must thoroughly understand that shifting the trail to the right (left) moves the muzzle to the left (right).

772. No. 2 is practiced in shifting the trail at the command for a deflection change of 50 mils or more.

The piece being in position and No. 2 at the trail handspike, the sight directed on an aiming point, the instructor commands, for example:

1. **Right 100.**
2. **Trail down.**

1. At the command **Right 100,** No. 2, standing in his position for shifting the trail, locates an object, as far away as possible, which is in line with the

graduation marked 100 on the **right** of the top of the shield, and shifts the trail to the **left** so as to bring the center division on the shield in line with the object selected.

2. At the command or signal **trail down** No. 2 lowers the trail.

The instructor makes the appropriate change in the deflection setting and verifies the accuracy of the work of No. 2.

If it be impracticable to select a definite object upon which to sight, No. 2 judges the amount by which the trail must be shifted by the width of the trail spade or float.

EMPTY CARTRIDGE CASES

773. To keep the empty cartridge cases out of the way of the gun squad, No. 2 catches the cases as they are ejected from the gun and throws them a little to the rear of the caisson wheel farthest from the piece.

Duties in Detail of No. 3

774. The duties of No. 3 in the service of the piece are:

1. To set the corrector.
2. To set the range on the fuze setter.
3. To set the fuze when the hand fuze setter is used.

THE BRACKET FUZE SETTER

775. The fuze setter is a device for setting time fuzes so that the projectiles will burst in the air at such height as may be desired. It has a range scale and a corrector scale.

776. To set the corrector, No. 3 turns the corrector worm knob with the right hand so as to bring the movable index opposite the corrector reading ordered. It must become habitual with No. 3 to turn the corrector knob in a clockwise

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direction to decrease the reading, and to turn the knob counterclockwise to increase the reading.

777. **To set the range,** No. 3 turns the range worm crank, with either hand, so as to bring the range reading opposite the fixed index of the range scale. It must become habitual with No. 3 to turn the range crank clockwise to increase the reading, and to turn the crank counterclockwise to decrease the reading.

778. In setting either scale, No. 3 must be trained to place his head so that he looks squarely at the scale and its index.

779. No. 3 is repeatedly practiced in setting the scales of the fuze setter by command.

The caisson being in position with the fuze setter lowered and No. 3 being seated at the fuze setter with his back to the inside of the right wheel of the caisson, the instructor commands, for example:

1. **Corrector 28.**
2. **3600.**

1. No. 3 sets off the corrector as soon as it is announced.
2. Sets the range scale at the range ordered.

780. The corrector having once been set, changes in the setting are usually made at the command: **Up (Down) (So many).**

The command **up** means that the corrector reading is to be increased; **down** means that the corrector reading is to be diminished.

No. 3 is practiced in this method as follows:

The corrector having been set at 28, the instructor commands, for example:

1. **Up 5.**
2. **3400.**

1. No. 3 increases the corrector reading by 5 points and, accordingly, sets corrector 33.
2. Sets the range at 3400.

781. Even though time fire is not being used, No. 3 always keeps his scales set according to the commands. If percussion fire is being used, No. 3 is thus always ready to pass to time fire.

THE HAND FUZE SETTER

782. The hand fuze setter is used only when the bracket fuze setter is not available. No. 3 sets the scales in a manner similar to that described for the bracket fuze setter. He also sets the fuze, No. 5 holding the round.

To set the fuze with the hand fuze setter, No. 3 engages the fuze setter on the fuze and turns the fuze setter to the right with a steady and uniform motion until the lug on the fuze comes firmly against the fuze-setter stop.

DUTIES IN DETAIL OF NO. 4

783. The duties of No. 4 in the service of the piece are:

1. In time fire to complete the setting of the fuze.
2. To insert the round in the breech.
3. In volley fire to call out the number of the round.

TO COMPLETE THE FUZE SETTING

784. The signal that **time fire** is to be used is the command: **Corrector (So much).** The signal that **percussion fire** is to be used is the command: **Shell,** or **Percussion.**

785. In time fire, to insure correct setting of the fuze, No. 4 turns the projectile to the right before removing it from the fuze setter, being careful not to turn it until the scales have been set.

In turning the projectile, No. 4 stands slightly to the left and rear of the fuze setter facing to the right front. His left hand, back down, grasps the round at or near the forward end of the cartridge

case. The palm of the right hand is placed on the base of the cartridge case, the fingers grasping the edge of the base. While turning the projectile, No. 4 takes care to hold the body of the projectile down on the guide and to keep the fuze well engaged by a steady pressure on the base of the cartridge case with the right hand. The projectile should be turned with a steady and uniform motion until the lug on the fuze comes firmly against the fuze setter stop.

TO INSERT THE ROUND

786. In time fire: Having accurately set the fuze, No. 4 withdraws the round from the fuze setter, taking care to draw it straight out so as to avoid any possibility of changing the setting. At the same time No. 4 slips his left hand toward the point of the projectile until it is about at the center of gravity of the round. As soon as the fuze is clear of the body of the fuze setter No. 4 springs toward the breech, stepping off with the right foot. As he approaches the gun he raises the point of the projectile slightly above the base and allows the weight of the round to be supported by the left hand. The fingers of the right hand are rigidly extended, the palm of the hand being kept firmly pressed against the base of the cartridge case. Taking position to the left and rear of the breech, the front of his body being parallel to the axis of the bore, eyes on the breech recess, No. 4 inserts the nose of the projectile in the chamber and shoves it forward, the extended right hand being brought sharply against the face of the breech. The closing of the breech insures the proper seating of the projectile. As soon as he has inserted the round, No. 4 quickly resumes his position at the fuze setter.

787. When the hand fuze setter is used, and in percussion fire, No. 4 receives a round of ammu-

nition directly from No. 5 and inserts it as above prescribed.

788. **In percussion fire** No. 4, after taking a round from No. 5 stands at his position at the breech and loads the piece **as soon as the previous round has been fired.** No. 4 is thus always ready to load the piece without loss of time. He takes care to stand clear of the breech during recoil.

789. No. 4 is practiced in setting the fuze in loading the piece. His training in his duties in volley fire is not begun until drill in the duties of the gun squad combined is commenced.

Duties in Detail of No. 5

790. The duties of No. 5 in the service of the piece are:

1. To take ammunition from the chest.
2. When the bracket fuze setter is being used, to insert the round in the fuze setter and to set the fuze.
3. When the hand fuze setter is used, to hold the round while No. 3 sets the fuze.
4. To pass the round directly to No. 4 in percussion fire, and when the hand fuze setter is used in time fire.

TO REMOVE A ROUND FROM THE CHEST

791. To take a round from the chest, No. 5 places himself to the left rear of the round selected, grasps the edge of the cartridge case with the fingers of the right hand, pulls the round to the rear, across the front of his body, and catches the body of the projectile with the left hand. As soon as he is relieved of one round No. 5 immediately takes another from the chest.

THE BRACKET FUZE SETTER

792. When the bracket fuze setter is used, No. 5 strips off the waterproof hood of the fuze. He

then inserts the point of the projectile in the fuze setter, taking care that the lug nearest the point of the fuze engages in the groove in the fuze setter, and sets the fuze for the settings then on the fuze setter as prescribed for No. 4.

793. Having set the fuze, No. 5 immediately takes another round from the chest, strips off the waterproof hood, and stands ready to insert the round in the fuze setter as soon as No. 4 has withdrawn the previous round.

THE HAND FUZE SETTER

794. When the hand fuze setter is used, No. 5 holds the round while No. 3 sets the fuze. Nos. 3 and 5 should occupy the same relative positions that they have in using the bracket fuze setter. As soon as No. 5 has withdrawn the round from the chest and stripped off the hood, he faces to the right rear and kneels on the right knee. The round is placed with the base of the cartridge case against the right knee, the edge resting on the ground. The point of the projectile is up so that the axis of the round is pointed in the direction of No. 3's head. No. 5 grasps the round with both hands, the right arm resting on the right thigh, back of the right hand up. The left arm rests against the outside of the left leg, back of the left hand down.

TO PASS A ROUND TO NO. 4

795. When he passes a round to No. 4, No. 5 places the right hand under the center of the cartridge case and the left hand under the center of the projectile, backs of both hands down. The round is held horizontally and well away from the body, the base of the cartridge being presented to No. 4. No. 4 receives the round by passing his left arm under the right arm of No. 5, grasping the round between the hands of No. 5, at the

same time grasping the base of the cartridge case with the right hand.

Duties of Nos. 6 and 7

796. Nos. 6 and 7 have no specific duties in the service of the piece after it is established in position. They act as spare cannoneers.

797. Upon going into action, Nos. 6 and 7 are utilized for the construction of concealment for the carriages, for line guards on the telephone lines, for the resupply of ammunition, etc. This work is done under the immediate supervision of the executive or his assistant.

Combined training at the piece and at the caisson

798. The duties of the gunner and Nos. 1 and 2 are mutually dependent. So also are those of Nos. 3, 4, and 5. Hence, it is advisable, at an early stage of instruction, to train each of these combinations separately. The same practice may be used to advantage from time to time after the drill of the gun squads in the firing battery has been taken up.

799. After the cannoneers are thoroughly instructed they are permanently assigned to those positions in which they have shown themselves most capable.

The Firing Battery and the Duties of Its Gun Squads

Composition, formation, and instruction of the firing battery

800. The firing battery comprises the guns and caissons of the first five sections of the battery, with the personnel and animals assigned to their immediate service. It is under the direct command, or orders, of the captain. The most suitable

lieutenants of the battery are selected for the immediate command of the firing battery when the battery commander is at some distance from the guns, and for the immediate supervision of the gun squads when the battery commander is near enough to the guns to give his orders and commands by word of mouth. This lieutenant is the **executive.** When the number of lieutenants present permits, the executive has a junior lieutenant assigned to him as assistant.

801. In the field it is desirable that the guns be placed approximately in line with regular intervals of approximately 17 yards between adjacent gun wheels. It is more important that the intervals be regular than that they be exactly 17 yards.

In the park the limbered carriages are formed in line or column of double sections, the caisson of each section being alongside of and at two yards interval from its piece, at such intervals or distances between sections as may be practicable. By the execution of **action front (rear, right, or left)** the carriages are placed in line in the firing position at sufficient intervals for the drill of the gun squads.

Duties in General of Officers of the Firing Battery and of the Noncommissioned Officers of the Gun Sections

802. Captain:

Commands the firing battery and, as a rule, conducts the fire.

803. The executive:

1. Usually conducts the firing battery to and establishes it in the firing position. Causes such measures to be taken as will facilitate the rapid opening of accurate fire. Sees to the preparation of all practicable protection for the personnel in addition to that provided by the shields.

2. Exercises immediate command of, or supervision over, the battery in the firing position.

3. Repeats all firing data when the captain is not near enough the battery to command it by voice.

4. Gives the command for commencing firing whether the captain be at the battery or not. The command by the executive is **Fire.** It is usually accompanied by a signal made by bringing the extended right arm from a vertical position sharply to the side. For salvos the executive gives the command fire as soon as he sees that all the pieces will be ready to fire in their proper turn. For volleys he may give the command **fire** immediately after the range has been announced or he may wait until all the pieces are ready, according to the instructions of the captain.

5. Assisted by the chief mechanic attends to the resupply of ammunition, under such general instructions as the captain may give.

6. Has charge of the replacement of casualties.

804. Assistant to the executive:

Assists the executive in the supervision of the gun sections, especially when difficulties or errors occur in a gun squad.

805. Chief of gun section:

1. Commands his section.

2. Makes sure of the identification of his part of the target or of the aiming point.

3. Keeps informed of the firing data so as to be able to repeat any parts not understood by the cannoneers but does not repeat anything unless it is called for by a subordinate. If a chief of section does not understand any item of the firing data he asks the executive for it thus: Site? Corrector? etc.

4. **In indirect laying** whenever the trail has to be shifted, puts the gunner approximately on the aiming point by glancing along one side of the

rotating head of the panoramic sight and causing the trail to be shifted until the side of the rotating head is in line with the aiming point.

5. Commands **with the lanyard** for the first shot when the ground is such that the trail spade is not easily seated, and sees that all the cannoneers step clear of the piece for the first shot.

6. Extends his right arm vertically as soon as the gunner has called **ready,** so as to indicate to the executive officer that the piece is ready to fire. The right arm is held vertical until his gunner commands **fire.**

7. Supervises and is responsible for all the details of correct service by his gun squad.

806. Gunner:

1. Performs his duties in the gun squad.

2. Commands **muzzle right (left)** when he has reached the limit of traverse of the gun on the carriage.

3. Commands **fire** so that his piece will be fired, **after having been accurately laid,** at the proper time.

Measure for Facilitating the Rapid Opening of Fire

807. Early opening of effective fire is facilitated by accurate establishment of the firing battery in the firing position without undue haste or confusion. To this end all officers, noncommissioned officers, and men should take particular care that the carriages are regularly and methodically established and quickly prepared for action.

808. If fire is not to be opened immediately upon occupying the position, a semicircular trench should be dug for the trail spade. If fire is opened at once it is always advisable to dig such a trench during the lulls in firing. Such a measure gives great facility in shifting the trail and is especially valuable in firing at moving targets.

809. The targets for light field guns are most frequently at a site of about 300 and at ranges near 3,000 yards. Hence the setting of sights, quadrants, and fuze setters at **Site 300, Corrector 30, Range 3000,** in the absence of exact data, and the leveling of instruments tend to hasten the opening of fire. If indirect laying is to be used the aiming point is usually known as soon as the carriages are unlimbered.

Since the front of the battery is usually established about perpendicular to the direction in which fire is to be delivered, the head of the panoramic sight should be turned on the aiming point as soon as the gun, prepared for action, is fully established in its position.

It is frequently practicable to communicate most of the firing data and to set the instruments before occupying a position, or at least some time before the fire is opened.

If no target is visible or none has been assigned to the battery when the position is occupied, the captain selects a prominent point near the center of the sector he is to cover and causes the guns to be laid upon it.

Deflection and Deflection Difference

810. Each gun in the battery must be so pointed that its projectile will fall in the direction of its part of the target.

811. The direction of each gun may be given by setting the sight at zero, then bringing the cross hairs on the target by shifting the trail and traversing the gun on the carriage.

Or, the direction of the gun may be given by setting the sight at a reading, called the **deflection,** previously determined and then bringing the vertical cross hair on a designated aiming point by shifting the trail and traversing the gun in its carriage.

812. When the guns are laid for direction by bringing the cross hairs on the target, each gunner sights at and his projectiles should fall on his own part of the target.

When the guns are laid for direction by bringing the vertical cross hairs on an aiming point it is usually necessary to give the guns different deflections in order that each piece may be brought on its own part of the target. The difference in deflections is called the **deflection difference.** It is usually small and is the same for any two adjacent pieces.

813. By **opening out** the guns like a fan, the front covered by the fire is increased; by **closing in** the guns, the front covered may be decreased. By increasing or diminishing the deflection difference, therefore, the front on which the projectiles fall may be increased or decreased at will.

The lines of fire of several pieces collectively directed form the **sheaf of fire.**

814. When an aiming point is used, the captain, assisted by his battery detail, determines the deflection for one of the pieces and the amount by which the other pieces must be opened out or closed in on this one in order that the shots may fall on the front desired.

The piece for which the deflection is determined or on which the others are to close or open is indicated by the number of the piece given in the command: **On (such) piece, Open (close), (so much).**

This piece is called the **directing piece.**

815. Since the deflection difference for any two adjacent pieces is the same, each gunner must multiply the deflection difference by the number of gun intervals between his piece and the directing piece in order to find the amount by which his deflection will differ from that of the directing piece.

816. In order to open out the sheaf the guns on the right of the directing piece must have their muzzles moved to the right and those on the left of the directing piece must have their muzzles moved to the left. Since decreasing the deflection moves the muzzle to the right and throws the shot to the right, each gunner on the right of the directing piece, in order to open the sheaf, must multiply the deflection difference by his number of intervals from the directing piece and subtract the result from the deflection announced. Since increasing the deflection moves the muzzle to the left and throws the shot to the left, each gunner on the left of the directing piece, in order to open the sheaf, must multiply the deflection difference by his number of intervals from the directing piece and add this result to the deflection announced.

817. Conversely, to close the sheaf on the directing piece, the gunners on the right must increase the deflection or add to it so as to throw the muzzles of their guns toward the directing piece, while those on the left must decrease the deflection or subtract from it in order to throw their muzzles toward the directing piece.

818. When the aiming point is in certain positions it may happen that the fire will be properly distributed on the target when the deflection of all the pieces is the same, or when the deflection difference is zero. The absence of any command **open** or **close** is the indication that all the pieces are to be laid with the same deflection.

819. After the first or subsequent firing, one of the guns may be directed on its part of the target while the others are not. In such cases the captain does not change the deflection but brings all the guns on the target by opening or closing on the gun which has the proper direction.

820. The necessity for taking full advantage of cover for the concealment of the guns, especially

from aircraft, may sometimes make it impossible to utilize a common aiming point or to see one piece from another. In such cases the executive causes the pieces to be pointed, by the compass or other means, as nearly as may be in the proper direction. One of the pieces is selected to fire a single round of time shrapnel so as to give a burst about 10 mils above the horizon visible from the guns and at as great a range as practicable. The remaining pieces are so elevated and the sights are so set as to enable each gunner quickly to turn the rotating head of his panoramic sight upon the burst without disturbing the laying of the piece. Each chief of section, having noted the deflection, causes the gunner to turn the sight on any suitable aiming point without disturbing the laying. The reading on the aiming point selected is then diminished by the reading on the burst if this latter reading was less than 3,200. If the reading on the burst was greater than 3,200 the reading on the selected aiming point is increased by the difference between the burst setting and 6,400. The deflection obtained by making the corrections just indicated is then set off on each sight and each gunner brings his cross hairs on the aiming point selected by traversing the piece. This results in the pieces all being laid on the point of burst of the shot fired.

By suitable commands for opening the captain forms the sheaf.

821. Having once formed the sheaf, the captain may change its direction by announcing a new deflection or by the command: **Right (Left), (So much).** At the command, for example, **Right 30,** each gunner **subtracts 30** from his deflection, sets his sight at the new deflection, and brings his vertical cross hair on the aiming point by traversing the piece. Each gunner has then moved the muzzle of his gun to the **right** through an angle

of 30 mils. Similarly, if the command be **Left 30** each gunner **adds** 30.

822. The direction and distribution may be changed simultaneously. At the command, for example, 1. **Left 30,** 2. **On 1st piece, Close 5,** each gunner first adds 30, and then applies the deflection difference. Having set off his correct deflection, each gunner brings his vertical cross hair on the aiming point by traversing the piece.

Range and Site

823. As the distance from the guns to the target increases the guns must be pointed more and more above the line joining the gun and the target in order that the projectile may reach the target.

824. Since targets are not always at the level of the gun, but are frequently above or below this level, the actual inclination of the gun to the horizontal when the gun is laid on a target is not the elevation due to range of the target only, but is a combination of this elevation due to range and of the difference of level between the target and the gun. When the gunner sets his sight shank at the correct range and, looking through the sight, brings the horizontal hair on the bottom of the target he automatically gives the gun the correct elevation above the line joining the gun and the target. This elevation of the gun above the line from the gun to the target is affected by the range only, and does not vary with the height of the target.

825. When the gunner does not sight directly at the target, but lays the gun for direction by sighting at an aiming point, the gun elevation must be given by the quadrant. The quadrant, therefore, has devices by which the angular elevation due to range may be set off and by which to make allowance for the difference in level between the gun and the target.

The first is accomplished by the range disk, the operator setting the range announced opposite the index.

The second is accomplished by the site device, which the operator has only to set at the value announced.

The range and site data having been set off on the quadrant and the quadrant being in place on the gun, the operator elevates or depresses the gun until the bubble of the elevation level is centered.

The proper combination of these two angular values is thus automatically made and the gun has the proper inclination to the horizontal to cause the projectile to reach the target.

826. The site is announced by the captain, **Site (so and so).**

Since the guns of a battery are usually on nearly the same level the site is usually the same for all the guns. Sometimes, however, it becomes necessary to give a different site to the several guns. In such cases the captain commands: **Site, No. 1 (So and so); No. 2 (So and so);** etc. The gunner of each piece sets the site indicated for his particular piece.

827. The range is announced for each salvo or volley.

Kinds of Fire

828. With respect to the instant at which the projectiles burst, fire is classified as **percussion** fire and **time** fire.

In **percussion** fire the projectile bursts when it strikes; the burst is then said to be **on impact.**

In **time** fire the projectile bursts in the air before reaching the ground.

829. Bursts on impact are secured by a fuze which explodes the bursting charge upon striking. Such a fuze is a **percussion** fuze. It does not have

to be set but is always ready to act after the projectile is fired.

830. Bursts in the air are secured by a fuze which can be set to explode the base charge at any time after the projectile is fired. Such a fuze is a **time fuze.** It contains a powder train which starts burning at the instant when the projectile is fired and, when the fuze is set, burns down to the base charge in a period of time dependent on the setting.

831. For convenience the fuze setter for setting the time fuze is graduated in range. But due to errors of the fuze and other causes the base charge will not always explode at exactly the range set off. Moreover, it is sometimes necessary to vary the height of burst. For this the fuze setter is arranged to permit changing the fuze setting without changing the range reading on the fuze setter. The device for accomplishing this is called **the corrector.** A corrector of about 30 ordinarily gives a height of burst of about 3 mils as seen from the guns. This height of burst is called **normal.** Raising the corrector **shortens** the part of the time train which must burn before the base charge is reached and therefore **raises** the height of burst. Lowering the corrector **lengthens** the time of burning and **lowers** the height of burst.

832. The gun squads must know the kind of projectile and the fuze which are to be used. This is indicated to them by the commands: **Shell**; or, **Percussion**; or, **Corrector (So much)**; or, **Up (Down) (So much).** The command **shell** indicates that shell are to be used. The command **percussion** indicates that shrapnel for percussion fire are to be used. Since shrapnel for percussion fire must have their fuzes set at safety and since the fuzes are carried at that setting in the chest, it is not necessary to use the fuze setter when the

command **percussion** is given; but, as the gun squads must be ready to change from percussion to time fire, No. 3 always sets his range scale at the last range announced.

Corrector (So much); or, Up (Down) (So much) indicates time fire with shrapnel and that the fuzes must be set.

Methods of Laying

833. When it is possible for the gunner to see the target clearly and to aim directly upon the part of it which the fire of his gun is intended to reach, the gun may be laid by the gunner for both range and direction.

This is called **direct laying.**

834. When it is impracticable for the gunner to aim directly upon the part of the target which the fire of his gun is intended to reach, the gun is laid by him for direction only. In this case an aiming point which can be clearly seen by the gunner is designated and a suitable deflection given, such that, when the line of sight is directed upon the aiming point, the gun will be directed upon the target.

This is called **indirect laying.**

835. For direct laying, the target must be distinctly visible through the sights; the guns must therefore be more or less exposed. For indirect laying the target need not be visible to the gunners; the guns may therefore be concealed. For these reasons and because indirect laying leaves to the captain complete independence in the manipulation of the sheaf of fire and ordinarily results in great regularity of heights of burst, ranges, and distribution, it is the usual method.

836. In firing at aerial targets or at small targets moving rapidly, direct laying is advantageous because corrections for site are eliminated and

changes in deflection are automatically made by keeping the cross hairs on the target.

In firing at large moving targets or at small targets slowly moving, indirect laying may be used with great facility.

Fire for Adjustment; Fire for Effect; Accuracy

837. It is usually impossible to determine before firing the exact laying which will certainly give hits on the target. It is therefore necessary to correct the laying according to the captain's observation of the bursts with reference to the target. The first part of the fire at any target is accordingly conducted so as to facilitate observation. Such fire is called **fire for adjustment.**

838. The fire must always be adjusted in direction, in distribution, and in range. In time fire the height of burst must also be adjusted.

As a rule, the direction, distribution, and height of bursts may be quite accurately observed and adjusted by making changes in the deflection, deflection difference, and corrector. Adjustment of the range is more difficult. It is usually impossible to determine a single range which will surely give hits on the target. On this account it is generally best to determine two ranges, one of which gives bursts short of the target and one of which gives bursts beyond the target. The determination of these two ranges is called **bracketing** the target. The difference between the two ranges is called the **bracket.**

839. Having obtained the adjustment, fire is opened at ranges and, in time fire, at a height of burst which will surely give hits on the target. This is called **fire for effect.**

840. Rapidity of fire without accuracy is unprofitable. Accuracy slowly obtained must often

result in lack of effect, because the enemy will have time to shelter himself from the fire. The ideal is accuracy with rapidity. This ideal can be attained by at first insisting on accuracy without regard to speed and by thereafter gradually developing it through persistent drill of the gun squads in the firing battery.

METHODS OF FIRE

841. The methods of fire are **fire by salvo, volley fire, volley-fire sweeping,** and **fire at will.** The use of salvos and volleys is habitual and both natures of fire are ordinarily used in firing at each target, particularly in time fire. Volley-fire sweeping is employed during fire for effect. Fire at will is exceptional, being used only for the close defense of the guns.

SALVOS

842. The command for a battery salvo is: **Battery right (left).** Upon the command **fire** by the executive the pieces are fired, at the command of the gunners, in order from the right at intervals of about two seconds.

843. The command for a platoon salvo is: **Right right (left),** or, **Left left (right).**

The first word of the command designates the platoon which is to fire.

If the command be **right right (left)** the first and second pieces only are loaded. Similarly, if the command be **left left (right)** the third and fourth pieces only are loaded.

The second word of the command indicates the flank from which the pieces designated are to be successively fired. Upon the command **fire,** by the executive, the pieces designated are fired, at the command of their gunners, in the order indicated at an interval of about two seconds.

844. The interval of two seconds may be increased by cautioning, after the command for the

salvo, **At (so many) seconds.** The interval thus prescribed will be used as long as salvos are fired until another interval is announced.

845. Salvos are particularly suitable for fire for adjustment on account of the facility with which the bursts may be observed.

VOLLEY FIRE

846. The command for battery volleys is: **Battery (So many) rounds.** Upon the command **fire** by the executive, each piece fires the designated number of rounds as rapidly as possible consistent with accuracy and without regard to the other pieces. To make certain that the correct number of rounds is fired, each No. 4 as he loads the piece calls out the range and the number of the round. As the last round ordered is loaded, he adds: **Last round.** Thus, the command being **Battery 2 rounds, 3200.** On loading the first round, each No. 4 calls **3200, One**; on loading the second round, each No. 4 calls **3200, Two; Last round.**

847. In exceptional cases it may be desirable to use one platoon only in volley fire. In such cases the command is: **Right (Left), (So many) rounds.** Only the pieces in the designated platoon are loaded and fired.

848. Volley fire is particularly suitable for fire for effect on account of the rapidity with which it may be delivered.

VOLLEY-FIRE SWEEPING

849. The purpose of sweeping is to distribute the fire over a wide front. It consists in changing the direction of each piece between shots.

This may be accomplished mechanically by a full turn of the traversing handwheel between rounds if there is not material lost motion in the mechanism. Or, if the reticule of the panoramic

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sight is provided with a horizontal scale, the line of sight may be shifted through an appropriate angle.

850. The commands for sweeping are: **Battery (So many) rounds, sweeping,** or, **Right (Left), (So many) rounds, sweeping.** The execution is the same as that of volley fire in every respect, except that after the first and each succeeding round of the sweep the gunner traverses the piece to the left by one full turn of the traversing handwheel, disregarding accurate laying in direction; or, if the reticule of the sight has a horizontal scale, instead of turning the handwheel he shifts the line of sight 10 mils to the left for ranges up to 2,500 yards, 5 mils for ranges exceeding 2,500 yards.

As soon as the last round of the sweep has been fired, the gunner traverses the piece back to the right until the line of sight is again on the right of his portion of the target or on the aiming point.

FIRE AT WILL

851. For the very close defense of the guns the command is: 1. **Target (So and so),** 2. **FIRE AT WILL.** At this command sights are set at deflection zero and range 1,000. Fuze setters are set at corrector 30 and range zero. Shrapnel only are used. Each gun is loaded and laid on the target. Upon the command **fire** by the executive, each gun is fired as rapidly as possible until the command **cease firing** or until the target disappears or actually reaches the gun. In fire at will, the gunner neglects all refinements of laying rapidity in this case being of more importance than great accuracy.

Classes of Targets, Appropriate Methods of Fire

852. Targets are classified with reference to their nature as **artillery, infantry, machine guns,**

etc. They are also classified according to their movement, or power to move, as **fixed** or **stationary, transient,** and **moving.** All of these may, of course, vary as to size and as to degree of movement.

853. Fixed, or stationary, targets are targets which are fixed to their position for at least a considerable time. Examples of such targets are buildings, trenches, artillery in position, troops held under cover by fire.

Transient targets are those which while fully exposed to fire are likely to remain so for a very brief time. Examples of such targets are infantry skirmish lines, machine guns, observation parties.

Moving targets are those which are changing their location. Examples of slowly moving targets are large bodies of troops on the march, infantry whether on the march or advancing to the attack, wagon trains on the march. Examples of rapidly moving targets are artillery at fast gaits, charging cavalry, cavalry at fast gaits, small bodies of mounted men, motor cars.

854. Against all fixed targets salvos are ordinarily used in fire for adjustment, which is usually continued until a suitable bracket has been obtained.

855. Against transient targets it is necessary to be content with a wider bracket. In extreme cases it may be desirable to assume a bracket of considerable depth based on the observation of the first bursts. Transient targets are usually attacked with shrapnel. Salvos are usually appropriate during fire for adjustment. Volleys are used in fire for effect.

856. Slowly moving targets or long targets moving across the line of fire are attacked by shrapnel in the same manner as fixed targets.

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Either direct or indirect laying may be used. During direct laying volleys are usual during adjustment as this method gives the gunner more independence in the instant of firing, and he is better able to take advantage of the moment when the target is most visible and his laying most accurate. Volleys are used in fire for effect.

857. Rapidly moving targets or small moving targets are attacked by shrapnel in the same manner as in the extreme case of transient targets. Volleys are ordinarily used both in fire for adjustment and in fire for effect. If the target is small indirect laying is usually ineffective.

Firing Data

858. The firing data embrace all the information and commands necessary to enable the gun squads to accomplish the orderly, rapid, and accurate service of the pieces. To this end it is essential that the firing data be communicated to the guns in an habitual sequence. First place must be given to the element of the data most essential to commencing the service of the pieces. The sequence should favor as far as possible the completion of one operation by a particular member of the gun squad before he is required to take the data for another.

859. The necessary data for indirect laying in their habitual sequence are—

1. The designation of the aiming point.
2. The deflection.
3. The deflection difference.
4. The site.
5. The kind of projectile (corrector, shell, or percussion shrapnel).
6. The method of fire.
7. The range.
8. The command, by the executive, **fire.**

860. The necessary data for direct laying in their habitual sequence are—

1. The designation of the target.
2. The deflection.
3. The kind of projectile (corrector, shell, or percussion).
4. The method of fire.
5. The range.
6. The command, by the executive, **fire.**

861. Fire at will being an exceptional and special method, in which the sight and the fuze setter have fixed settings, and direct laying with shrapnel is always used, the only firing data necessary are the designation of the target, the method of fire, and the command **fire.**

862. It is generally possible to communicate certain items of the data before the moment for opening fire. For example, in indirect laying the aiming point may be designated and the approximate deflection and the deflection difference announced as soon as the guns are established.

863. Except when the captain is near enough to the battery to make his voice heard by all the gun squads, the executive repeats all the firing data.

Without awaiting any signal or command from the captain, the executive gives the command **fire** at such time after the range is announced as will insure the orderly delivery of the fire.

864. Each gunner gives the command **fire** so that his piece will be fired at the proper time after the command **fire** by the executive. No other item of the firing data is repeated unless it is called for. When a member of a gun squad does not understand any item of the firing data he asks his chief of section for it, thus, **Site? Corrector?** etc.

865. The complete firing data are always necessary before firing the first salvo or volley after

occupying a position. After the first salvo or volley the captain announces only so much of the data as he desires to change, except that the range is always given as a definite signal to load and for the executive to give the command **fire** at the proper time.

In firing shell or percussion shrapnel each piece is loaded as soon as it is fired; but the range is nevertheless given as a definite signal for the executive to give the command **fire** at the proper time.

Service Practice

DEFINITIONS

866. Angle of departure: The angle between the plane of site and the line of departure.

Angle of fall: The angle between the plane of site and the tangent to the trajectory at the point of fall.

Angle of incidence: The angle between the plane of the surface struck and the tangent to the trajectory at the point of impact.

Burst center, center of burst, or **mean point of burst:** The point about which the points of burst of several projectiles are evenly distributed.

Burst interval: The distance in the plane of site from the point of burst to the target.

Burst range: The distance from the muzzle of the gun to the point of burst.

Counterslope: A slope which descends toward the enemy and is wholly or partially hidden from him by the covering **crest** of the reverse slope.

Crest: The summit of a ridge.

Curved fire: Fire with low muzzle velocity, the elevation not exceeding 540 mils.

Danger space: The distance, in the plane of the slope considered, over which an object of a given height would be struck.

Deflection: The angle between two vertical planes containing, one the line of sight, and the other the axis of the bore.

Deflection center: The point about which bursts in air or impact are evenly distributed in direction.

Direct fire: Fire with high muzzle velocity, the elevation not exceeding 360 mils.

Direct laying: Pointing the gun for direction and elevation by directing the line of sight upon the target.

Drift: The departure of the projectile from the plane of fire due to its rotation and to the resistance of the air.

Elevation: The angle between the plane of site and the axis of the bore when the gun is laid.

Height of burst: (1) The vertical angle between the plane of site and a right line joining the muzzle of the gun and the point of burst. (2) The ordinate of a point of burst.

Height of burst center: The point about which bursts in air are evenly distributed in height.

High angle fire: Fire with elevation exceeding 540 mils.

Indirect laying: Pointing the gun for direction by directing the line of sight upon an objective other than the target, and for elevation by the use of a quadrant or elevation level.

Jump: The angle between the line of departure and the axis of the bore before firing; hence, the difference between the elevation and the angle of departure.

Line of departure: The prolongation of the axis of the bore at the instant the projectile leaves the gun.

Line of sight: The right line passing through the sights and the target or the aiming point.

Mean height of burst: (1) The height of the burst center. (2) The average of several heights of bursts.

Mil: The unit of angular measure, one sixty-four-hundredth of a circle. The arc which subtends a mil at the center of a circle is, for practical purposes, equal to one one-thousandth of the radius. The arc and its tangent are nearly equal for angles not greater than 330 mils.

Military crest: The line nearest a crest from which all the ground toward the enemy may be seen and reached by fire.

Muzzle velocity: The velocity of the projectile at the instant it leaves the bore. Velocities are measured along the tangent to the trajectory at the point considered and are expressed in feet per second.

Normal corrector: The corrector setting which gives a normal height.

Normal height: The height of burst giving the maximum effect from a projectile.

Ordinate: The distance of a point of the trajectory from the plane of site. The **maximum ordinate** is the ordinate of the highest point of the trajectory.

Parallax: The angle at any point subtended by any given line.

Plane of fire: The vertical plane through the line of departure; also called **plane of departure.**

Plane of site: A plane containing the right line from the muzzle of the gun to the target, and a horizontal line perpendicular to the axis of the bore at the muzzle.

Point of burst: The point at which a projectile bursts in the air or at which it would have burst in the air had it not struck the ground.

Point of fall, of impact, or of graze: The point where the projectile strikes.

Probable error: The amount of error that, in

a large number of occurrences, will be as often exceeded as not.

Quadrant angle of departure: The angle between a horizontal plane and the line of departure.

Quadrant elevation: The angle between a horizontal plane and the axis of the bore when the gun is laid.

Range: The distance from the muzzle of the gun to the target.

Range center, center of impact, or **mean point of fall:** The point about which the points of fall, reduced to the plane of site, are evenly distributed.

Range of burst center: The point about which bursts in air are evenly distributed in range.

Remaining velocity: The velocity of the projectile at any point of the trajectory.

Reverse slope: The slope which, from the direction of the enemy, is hidden by a ridge of which the slope is a part.

Site: The angle between a horizontal plane and a right line joining the muzzle of the gun and the target; called also the **angle of position.** The origin of site scales is taken at 300.

Terminal or **striking velocity:** The remaining velocity at the point of burst or point of fall.

Time of flight: The time in seconds required for the projectile to travel from the muzzle of the gun to any point of the trajectory—usually to the point of fall or of burst.

Trajectory: The path described by the projectile in its flight.

The Trajectory

The trajectory is the path described by the projectile in its flight.

867. The relation between the elements of the trajectory is influenced by the muzzle velocity of the projectile, by the angle of departure, and as soon as the projectile has left the bore, by the

force of gravity, the resistance of the air and the rotation of the projectile around its axis.

If the force of gravity, the resistance of the air, and the rotation of the projectile around its axis could be eliminated, the projectile would describe a straight line and its velocity would remain constant. If the projectile be supposed to be influenced only by its velocity, the angle of departure, and the force of gravity, it can easily be shown that it would describe a curve, the highest point of which would be the center of the trajectory, and that both halves of the trajectory would be identical in shape. But the resistance of the air acts to reduce the velocity of the projectile from the instant it leaves the muzzle, and consequently influences the path which it describes, so that in reality the highest point of the trajectory is nearer to the far end, and the two parts of the trajectory are unequal and unsymmetrical.

In order to force the projectile to travel along its trajectory with its point foremost, a rotary motion is imparted to it by the rifling in the gun.

868. When the target and the gun are in the same horizontal plane, the proper elevation for the gun is the range-table elevation.

When they are not in the same horizontal plane, the proper elevation for the gun is the range-table elevation plus or minus the site. The site is additive if the target is higher than the gun, subtractive if it is lower.

869. When direct laying is used, the site is automatically taken into account, as the line of sight is directed on the target. On the other hand, when the elevation is given by the quadrant it must be increased or diminished by the site, so as to bring the trajectory on the target.

870. The remaining velocity decreases as the range increases.

871. The time of flight increases more rapidly than the range.

872. The drift increases more rapidly than the range. By increasing the deflection by the amount of drift for any range the axis of the bore may be pointed as far to the left of the target as the shot would drift to the right.

873. The fuze of the shrapnel permits its use for either percussion or time fire. In time fire, under normal atmospheric conditions, the fuze should cause explosion at a determined burst interval.

874. When the time train burns too slowly, low points of burst, bursts below the target, or explosions on impact are obtained. When it burns too quickly, high points of burst are obtained.

875. When a shrapnel explodes in the air the bullets are expelled from the case to the front, their paths, taken collectively, assuming the general shape of a cone, called the **cone of dispersion,** the apex of which is the point of burst, the axis coinciding approximately with the continuation of the trajectory.

The angle between the two lines cut from the surface of the cone of dispersion by a plane passing through its axis is called the **angle of opening.**

The angle of opening depends upon the relation between the velocity of rotation and the remaining velocity.

MANIPULATION OF THE TRAJECTORY IN THE PLANE OF FIRE

876. In the course of firing, the captain will be constrained to utilize the relations existing between the elevation, the site, and the corrector, which are the following:

The location of the trajectory in the vertical plane depends upon the site and the elevation.

It may be changed by changing one or the other of these elements, or the same location may be retained by making the proper changes of both in opposite senses.

A variation of the site affects the range the same as an equal variation of the elevation.

The height of burst under normal conditions depends only on the site and the corrector.

If the site only is varied, the point of burst is displaced in height, but not in range; if the corrector only is varied the point of burst is displaced at the same time in both height and range. Simultaneous and equal but opposite changes of site and corrector cause no change in height of burst, but the burst range changes.

The burst range depends only on the fuze setter range and corrector settings. It is increased or diminished by increasing or diminishing the fuze setter range or by lowering or raising the corrector.

The point of burst of two or more rounds are not coincident unless these three elements remain constant, or unless all three change at the same time by suitable amounts and in the proper relation.

The differences in range shown in the range tables as corresponding to given variations of elevation are measured in the plane of site. On slopes greater than the plane of site, such as a counterslope, the difference in ranges to points of fall will be less than that in the tables. On terrain inclined in the opposite sense, such as a reverse slope, the difference in ranges to points of fall will be greater than that in the tables.

General Provisions

877. To render effective assistance to other arms upon the battle field, field artillery must be able to deliver a timely and overpowering

fire upon any designated part of the enemy's position.

878. The battery is the fire unit.

879. Those areas of the hostile position within which fire is to be delivered by particular artillery units are called **sectors.** They are usually described by reference to prominent points of the terrain, right lines to which, from the observing station of the commander of the artillery unit considered, limit the area assigned. Within, and sometimes outside, the sectors assigned, fire must be delivered upon objectives called **targets.**

880. The tactical command of one or more fire units with a view of bringing their fire to bear upon a suitable position upon the proper targets at the appropriate time is called **fire direction.**

881. The dispositions that must be made and the technical determinations of the data necessary before opening fire constitute **preparation of fire.**

882. Conduct of fire consists in employing the technical means necessary to cause fire of the desired nature to be brought to bear upon the target.

883. The officer charged with the conduct of fire must be the master of the fire of his guns. He must be able to turn the fire promptly upon any target at will and to regulate its intensity and distribution as circumstances require. The attainment of this condition requires on the part of the officer complete familiarity with the weapons at his disposal and skill and quick decision in their use, and on the part of the organization thorough knowledge of the matériel, uniform and reliable service of the piece, cooperation of all parts, and strict fire discipline.

884. Accurate and skillful cooperation of several batteries under a single command is the foundation of proper fire direction.

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885. Owing to inaccuracies in the determination of firing data, to the influence of weather conditions, to errors made in the service of the guns, and to imperfections in matériel and ammunition, fire must be delivered and, on the basis of observations, corrected to insure effectiveness upon the target. During such fire effect is desirable. Fire of this nature is called **fire for adjustment.**

When fire has been thus adjusted it must be continued, often with changed data, to secure effect. During such fire continued observation is necessary. Fire of this nature is called **fire for effect.**

POSITIONS

886. Artillery may be posted for **immediate action, in observation,** or **in readiness.**

When posted for **immediate action** the guns are unlimbered and fire is opened as promptly as possible upon the indicated targets.

When posted **in observation** the guns are unlimbered and all preparations made for opening fire at the desired moment upon the existing or expected targets.

When posted **in readiness** the guns are not unlimbered. They are held under cover near a position for possible immediate action, but so that they can be moved quickly to another locality if the development of the tactical situation so requires.

887. Positions are defined as **masked** or **in the open,** according as they afford concealment from the hostile position or not.

When no concealment is afforded the guns are said to be **in the open.**

When concealment is afforded, the guns are said to be **under cover** or in a **masked position,** and the fire is referred to as **masked fire.**

The degree of concealment varies. Thus:

(a) If the guns are posted so that through the sights the hostile position can be seen over the mask, they are said to be **in the open.**

(b) If where a dismounted man can just see the hostile position over the mask, they are said to have **dismounted defilade.**

(c) If where a mounted man can just see the hostile position over the mask, to have **mounted defilade.**

(d) If so that the flash of the gun will be concealed from the hostile position, to have **flash defilade.**

Positions are described by the foregoing terms.

888. The hostile positions against which defilade is taken may be the target to be attacked; preferably, however, defilade is taken against the highest position from which enemy parties can effectually observe.

889. A defilade of 4 yards is sufficient to conceal the flash of the gun by day. A defilade greater than this is still referred to, however, as **flash defilade.**

Complete concealment is obtained only in positions having flash defilade.

890. The captain of a battery acting alone usually has great latitude in choosing the position for his battery.

In battalion the choice of a battery position is limited by the battalion commander, who must consider neighboring batteries and many other conditions.

891. By whomever it may be chosen, the position of the guns should conform to certain conditions whose requirements are frequently contradictory.

First. The battery should be able to fulfill its tactical mission; that is, it must be able to fire effectively upon its targets.

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Second. It should be as little exposed as possible to hostile observation or fire.

Third. The facilities for command of the battery should be such as will insure the rapidity of fire demanded by the tactical situation and the nature of the targets.

Duties of Officers

892. Due to the extensive use of cover brought about by the efficiency of modern firearms, the targets of artillery are certain to be concealed from view a greater part of the time and likely, when visible, to remain so but a short time. To find out where the enemy is, to determine definitely the location and nature of hostile bodies, and to secure the information which will enable the guns to open prompt and effective fire have hence become duties of the first importance. **Before the commencement of the action and through all its phases** this information must be sought. Preparation must be made on the tactical side for posting the guns where they will be most effective, and on the technical side for securing the data which will permit fire to be opened promptly on all the positions which the enemy is known or expected to occupy.

893. The commander of the troops determines the object of the action, fixes the extent of artillery support to be furnished the larger units, and indicates important objectives for special attack.

The distribution of objectives and the determination of the way in which the artillery is to attack them are the province of the artillery commander.

894. At the beginning of the action the artillery brigade commander, knowing the objective of the infantry, what troops are designated to attack these objectives, and the degree of support

for the different attacks, distributes the artillery at his disposal so as best to accomplish the desired results.

895. The regimental commander causes his unit to take position and assigns sectors to the battalions in accordance with the orders he has received.

896. The battalion commander directs the fire by assigning targets to the batteries and by furnishing them such information and data as will tend to increase the efficiency of their fire.

897. Within the battalion changes of objectives are usually ordered by its commander and communicated to all batteries concerned, but a battery commander may order change of objective, on his own responsibility, for the support of troops in a critical situation, or when necessary for the close defense of his guns, reporting his action as soon as practicable to his immediate superior.

As such cases usually necessitate fresh adjustment, involving loss of time, the targets should not be changed except in emergencies until the results sought against the former target have been fully attained.

898. When communication is broken between a battery commander and his battalion commander the former will take over the duties of fire direction.

899. **Fire direction** is the function of battalion commanders, who exercise it in detail by assigning targets to particular batteries, and of higher field artillery commanders, who usually exercise it by assigning sectors to battalions.

900. **Conduct of fire** is the function of battery commanders.

901. The higher artillery commanders are concerned especially—

1. To procure by all possible means definite information as to the position of hostile bodies, or as to the positions liable to be occupied by them.

2. To select positions or areas to be occupied by the different units of artillery and to cause reconnaissance officers to determine the necessary firing data for these positions.

3. To assign each unit its particular duty or task, designating, when appropriate, those units for **immediate action** and those to take position **in observation** or **in readiness.**

4. To formulate clearly in their minds the terms or methods which they will employ in the designation of objectives (targets, aiming points, registration marks, etc.).

5. To provide each subordinate commander and to keep him provided with all available information, technical and tactical, which will assist him in the performance of his duties.

For this purpose, to organize the service of information and communication so that information as to positions and movements of the enemy and of our own troops may, on the one hand, be quickly obtained and, on the other, be quickly transmitted.

6. To organize and maintain the service of ammunition and other supplies.

902. Battery commanders are concerned especially—

1. To select suitable observing stations for themselves and to post auxiliary observing parties, if practicable, so that they may assist in the observation of fire.

2. To examine the target assigned and endeavor to determine clearly its nature, its extent, and its relation to surrounding objects.

3. To study the terrain in the neighborhood of the target; locate, if possible, any ravines, hollows, or obstructions which would hide the fall

of projectiles, and decide whether it will be necessary or preferable to adjust the fire upon some particular part of the target rather than upon the whole front.

4. To measure the front to be attacked and decide upon the method of distributing the fire.

5. To decide upon the method of laying, selecting an aiming point if indirect laying is to be used.

6. To determine the initial firing data, if they have not been furnished by the battalion commander or reconnaissance officer or from other sources.

7. To decide whether the adjustment is to be by time or percussion fire, and whether by platoon or by battery.

903. The executive establishes his station near the guns, in a location from which he can most readily exercise his functions and communicate with the station of the battery commander.

904. The time available for the performance of the foregoing duties depends entirely upon the nature of the action. In some cases they must be performed with the utmost celerity; in others the opportunity is afforded for deliberate and complete preparation before opening fire. **Every effort must be made to reach the position in advance of the moment for action, and thus gain the opportunity to appreciate the situation and make the necessary dispositions for the prompt opening of effective fire.**

Observing Stations

905. The officer conducting the fire should choose his observing station so that he can see all of his sector and as much as possible of the adjoining terrain.

To facilitate the transmission of orders and the proper exercise of command the station should be as near the guns as the conditions permit.

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This may often be accomplished by using elevated observing stations, such as trees, buildings, etc., or a specially prepared ladder or tower.

When the observer is in immediate proximity to the guns it is usually necessary for him to take post on their windward flank in order that his view may not be cut off by dust and smoke and that his voice may carry more certainly.

906. The commander of an isolated battery frequently has a wide latitude in the selection of his observing station. But the proximity of other batteries, the advantage of flash defilade and of withdrawing the guns from their mask to reduce the chance of their being reached by searching fire, and the compelling necessity of observation of the sector may impose a station remote from the guns. In such a case reliable communication must be established and maintained.

907. If the station is in immediate proximity to the guns or is apt to be subjected to the enemy's searching fire, suitable protection from hostile fire should, whenever possible, be provided for the observing officer.

908. Battalion commanders should seek observing stations from which they can both surely see the terrain assigned to their units and communicate quickly and certainly with their battery commanders without complicating the communication of the latter with their batteries. The most favorable situation is one near to and between two of the batteries where the stations of the major and two captains may be closely associated.

909. Auxiliary observers may frequently be used with advantage at stations near the targets or at a considerable distance to a flank of the line of fire. Elevated stations are particularly favorable. In the selection of such stations the most important requirements are a plain view of

the target and its adjoining area, cover from hostile discovery, and sure and swift communication with the stations to which they are auxiliary.

Observers close to the target should preferably be established from battery personnel. Except when a battery is acting alone, flank observers will ordinarily be supplied by the battalion commander. Flank observers who are intended to assist in adjustment of fire should be in visual communication with the unit from which they are sent out.

910. Auxiliary observing stations are also established in captive balloons and in mobile aircraft.

Communications

Methods

911. The best means of communication is the voice, using the megaphone if necessary, but frequently communication must be by telephone, by buzzer, by signals, by relays of men for voice transmission, by courier. The whistle also may be used.

912. Alternative means of communication should habitually be established.

913. Each battery, each battalion headquarters, and each regimental headquarters is provided with suitable apparatus for signaling and for electrical communication.

The available matériel must be employed according to a flexible scheme, and each case must be solved according to the particular necessities.

914. Frequently the higher commanders will find it convenient to post themselves near one or more of their subordinates and communicate with them by word of mouth or by couriers. The matériel and personnel thus freed from other use may

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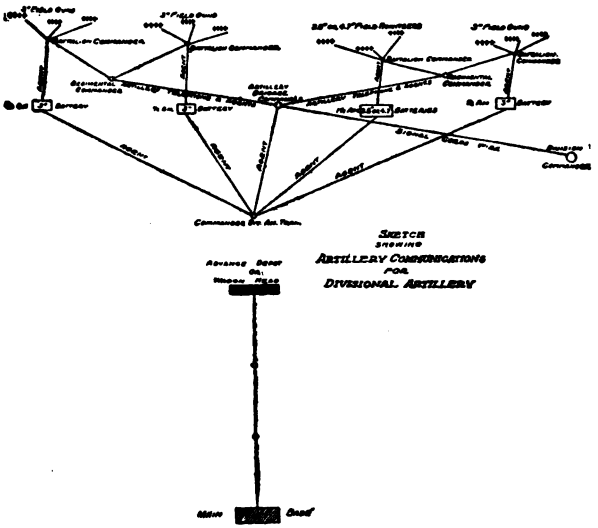
be utilized in establishing communication with auxiliary observing stations, ammunition trains, or reconnaissance officers and scouts accompanying other troops. (See sketch below.)

PREPARATION OF FIRE

915. By skillful preparation of fire the time required to secure adjustment may be greatly



SKETCH SHOWING ARTILLERY CONSIDERATIONS FOR DIVISIONAL ARTILLERY

abridged, and the ability may be gained to strike a vulnerable enemy by surprise with fire which is from the outset effective.

916. In the preparation of fire the captain usually requires assistance. This is obtained from members of the special details consisting of the instrument detail, the signal detail, and the scout detail.

The instrument detail consists of one instrument sergeant, one range-finder operator (generally of a first-class private), and one horse holder.

The signal detail consists of one telephone corporal and two operators, designated as operator No. 1 and operator No. 2.

The scout detail consists of one corporal and one second-class private in peace and of two corporals in war.

917. The instrument sergeant is in general charge of the instruments and equipment used by the special details.

He is informed at the earliest possible moment as to the situation, the sector assigned, the location of hostile and friendly troops, the reference point, the target, the position of the guns, and the aiming point.

He sets up the telescope and the aiming circle, operates the latter, and calculates firing data.

He keeps a record of the firing and assists the captain in observing the fire and studying the terrain, and in collecting, recording, and transmitting data.

918. The range finder is responsible for the condition, care, and operation of the range-finding instrument.

He receives the same information as the instrument sergeant and finds for him the ranges required.

He assists the captain in observation of the fire, the enemy, and the terrain.

919. Scout No. 2 is informed as early as possible as to the situation, the sector assigned, the location of hostile and friendly troops, and the target.

He prepares such place or panoramic sketches as may be directed.

He observes the sector, especially the target, reporting changes in its formation, appearance, and movement, and any effect upon it.

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He may be assigned to particular duties, such as to observation regarding the security of the battery, to observation of friendly troops or of hostile bodies other than the target, to assistance of other members of the detail.

920. Other members of the battery commander's detail not otherwise engaged may be assigned to duties in connection with preparation of fire and its conduct.

921. Whenever a position is occupied, all practicable steps will be taken to provide protection for the personnel additional to that afforded by the matériel, and shallow trenches will be prepared to facilitate shifting the trails.

Designation of Objectives

922. Objectives must be designated in a prompt, concise, and unmistakable manner. Officers must exercise themselves in describing objectives of all kinds, in all available forms of terrain, and must accustom those under them to the terms and methods employed in the description. Practice of this character should habitually form a part of firing instruction and should also be included in the instruction of scouts and agents.

923. Targets and aiming points are most clearly designated by word of mouth and to a person standing near by.

On the occupation of a position the aiming point and the expected targets should, as far as practicable, be thus pointed out to the officer commanding the guns.

924. If the objective is in itself inconspicuous, it is usually best to designate first the most prominent object in its general direction, then to give the angular distance between this reference point and the real objective, and then to give the distance to and description of the latter.

The usual method of procedure is as follows:

1. Indicate the general direction of the objective.
2. Designate the most prominent object in the direction indicated.
3. State the angular distance from this auxiliary object to the objective.
4. Characterize the objective.

Thus:

1. At 2 o'clock horizontal.
2. At 3,000 yards a large stone house, square, two storied, with a cupola on top.
3. Five hundred mils to the right of the cupola.
4. At 2,500 yards a light battery in position in rear of the large orchard.

Or:

1. Northwest.
2. At 5,000 yards two symmetrical hills of the same height.
3. The left peak the reference point.
4. At 7 o'clock vertically, a field of brown weeds.
5. In that field, a machine-gun battery.

Or:

1. The lone tree on Artillery Ridge.
2. Two hundred yards south and four hundred yards west, a bare stretch of road.
3. Beyond the road, machine guns.

925. The designation of objectives may be greatly facilitated by the use of maps or by causing a position or place sketch of the terrain to be prepared and copies to be furnished the different subordinate commanders concerned. On such a sketch important landmarks and military objectives should be named or numbered for ready reference.

Panoramic sketches may be used in a similar manner, but when individuals using such a sketch for identification are widely separated, allowance must be made for difference in point of view.

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926. Maps ruled into small rectangles that may be readily described by reference to horizontal and vertical notations on the margins are highly useful in the designation of objectives and areas.

PARALLAX

927. The parallax of an objective is the angle at a point of the objective subtended by a platoon front, 20 yards, at any place. Its value in mils is quickly calculated by dividing 20 by the number of thousands of yards from the place in question to the objective. Thus, the distance to an objective being 2,800 yards, its parallax is 7, fractions less than .5 being disregarded.

In calculating parallax it is sufficiently exact in the usual case to take as the divisor the whole number representing the number of thousands of yards in range; thus, 3 instead of 2.8 in the example given.

928. The parallax of an objective is greatest when the objective lies on the normal to the middle of the platoon front considered. As the direction of the objective departs from this normal the parallax decreases until it becomes zero, when the objective is on the line of the platoon front prolonged. This is known as the change of parallax due to **obliquity.**

929. The correction for obliquity may be determined with sufficient accuracy by multiplying the parallax, obtained through assuming the objective to be on the normal to the platoon front considered, by .9, .7, .4, and 0.0, when the angular distance of the objective from the normal is 400, 800, 1,200, and 1,600 mils, respectively. By interpolation the multipliers for other obliquities may be obtained.

930. The parallax of a target is always positive. The parallax of an aiming point in front of the line of guns is positive, of one in rear negative.

AIMING POINTS

931. The selection of suitable aiming points for indirect laying calls for special attention. The best aiming points are:

1. Continuously visible through the panoramic sight of each gun.
2. Easily designated and identified.
3. At a considerable distance from the guns.
4. Of narrow width and sharp definition.
5. Near the normal to the line of guns or near the line of the guns prolonged.

It will frequently be impracticable to select an aiming point fulfilling all these conditions.

932. The use of the same aiming point by all of the guns of a fire unit simplifies both fire direction and conduct of fire. When time is available before the guns come up it is best to go to the point where each gun is to be placed and make sure that the aiming point will be visible through the sight from that point. But a common aiming point is not indispensable.

933. Although refinements in calculation of parallax are uncalled for, errors in its computation should be minimized by the selection of distant aiming points. Usually points more than 2,000 yards distant will be found most suitable.

934. Narrowness and sharp definition in an aiming point make uniformity of laying more certain. If a broad aiming point must be chosen, the part of it to be used must be designated. If a tree, its trunk may be designated; if a ledge of rock, a certain edge; if a building, a certain chimney, peak, or gable.

935. The rate of change in the value of the parallax within 400 mils of the position of its maximum value, and its actual value within 400 mils of the position of its minimum value are so

small that for aiming points within these angles the parallax need not be corrected. For other positions, the parallax must be corrected for obliquity. Aiming points should be chosen, if possible, to reduce calculations.

936. A point in rear of the guns is preferable to one in front, because the top shield does not interfere with vision.

A point on a flank is appropriate when at a greater distance than 1,000 yards and when enough to the rear to prevent its being obscured by any of the matériel or personnel. At shorter distances the recoil of the gun carriages materially changes the parallax, thus shifting the sheaf of fire and causing irregularities of distribution.

937. When artificial aiming points must be established near the guns, the best direction for a common one is directly in rear of the center of the line of guns. To reduce the effect of recoil upon parallax a separate one may be placed directly in rear of each gun.

FIRING OVER A MASK

938. When a position for masked fire is to be occupied, it is necessary to make sure that the projectiles from each gun will clear the mask and reach ground which is occupied or is expected to be occupied by the enemy.

939. If the guns are already in position and the mask is not more than 200 yards in front, the guns may be given the elevation and site corresponding to the nearest expected position of the enemy, and a glance through the bores will tell whether the projectiles will clear the mask. At greater distances this method is not applicable because the trajectory is not a straight line.

940. In the general case clearance of the mask should be assured before the guns arrive, so as

to preclude indecision and delay in posting them. It is necessary to decide what are the shortest range and the minimum site to be used. It can then be decided whether from the contemplated position of the guns the projectiles will clear the mask and reach the desired territory. If they will not, a place must be found from which they will.

To solve the problem the height in mils of the trajectory at the mask is determined and compared with the height of the mask in mils.

941. The sliding scale on the ruler may be used to determine the height of trajectory at the mask as follows:

1. Determine (a) the distance from guns to mask, (b) the difference of level in mils between guns and target, (c) the range to target.

2. Move the sliding scale on the ruler until the graduation indicating difference of level between guns and target is opposite that indicating distance to mask; then opposite the graduation-indicating range target will be found the **height of trajectory** (h) in mils at the mask.

3. Determine the height of the mask in mils. If it is less than h, the projectile will clear the mask; if not, move backward or forward until a point is reached where it is less.

Example: A position about 200 yards in rear of a crest is contemplated, which will be masked from the opposing artillery and will permit fire on an advance infantry position which is about 2,000 yards from the guns and has a site of 315.

R = 2,000 yards.
d = 200 yards.
a = 15 mils.

Placing +15 of the sliding scale opposite range 200 on the ruler, there is found opposite range 2,000 the value of 63 for h.

The site of the crest is found to be 340; that is, the crest is 40 mils above the position contemplated for the guns. The projectile will clear the crest by $63 - 40 = 23$ mils.

942. The sliding scale on the ruler also permits the determination of the minimum range at which fire will clear the mask.

Thus, taking the data of the preceding example, it is quickly determined that the minimum range is 1,300 yards.

943. A convenient method for determining the distance from a mask at which the projectile will clear it is as follows:

1. Determine the height of the mask in yards.
2. Divide four times this height by the range from the mask to target in hundreds of yards.

The result will be the distance, with a large factor of safety, in hundreds of yards, from mask to gun so that the trajectory will clear the mask.

If it is desired to limit definitely the space in front of the mask within which fire cannot be delivered, the **dead space**, the distance in hundreds of yards from the mask to the farther limit of the dead space, instead of the range from mask to target, should be taken as the divisor.

Another method is as follows:

From the covering crest measure the site of the target or the site of the limit of permissible dead space. To this add the elevation in mils corresponding to the minimum range from the mask. If this sum is greater than the site of the crest, measured by a man kneeling at the gun position, the mask will be cleared. Or, subtract this sum from 600. The guns will clear the mask from any ground whose site, measured from the crest, is greater than the result of this subtraction.

944. With sufficient accuracy for the solution of mask problems the elevation in mils corre-

sponding to a given range is equal to 10 less than three times the hundreds of yards in range.

MEASUREMENT OF ANGLES

945. Angles may be measured in mils by means of the telescope, the aiming circle, the ruler, the scale in the field glass or its known field of view, or by handbreadths.

The telescope and the aiming circle are instruments of precision. The graduated field glass affords means of measuring angles accurately. When neither the telescope nor aiming circle is available, or when time does not admit of their being set up, use may be made of the less reliable means, practice with which will insure considerable accuracy.

946. For measuring by handbreadths, each individual will obtain the best results by predetermining, according to the methods just described, the value in mils of certain parts of the hand.

Average values are given below, it being presumed that the hand is held vertically, palm outward, arm fully extended to the front:

	Mils.
Width of first finger at second joint	40
Width of second finger at second joint	40
Width of third finger at second joint	35
Width of little finger at second joint	30
Width of first, second, and third fingers at second joint	115
Width of first, second, third, and little fingers at second joint	150
Width of thumb	40

947. Repeated practice should be had on varied terrain in measuring both horizontal and vertical angles with the field glass, the ruler, and the hand, the results being checked by accurate instrumental measurements.

National Service Library

DEFLECTION

948. To overcome the effects of wind and drift, a correction in deflection may be necessary. Its amount is generally small, however, and with a little experience may be readily estimated.

The correction for drift is always additive; that for wind may be either additive or subtractive, depending upon the direction of the wind. The value of each correction is first estimated; they are then combined to secure the resultant correction.

The following rough rules may be of assistance:

1. To overcome drift increase the deflection by 3 mils for ranges up to 3,500 yards; by 5 mils for longer ranges.

2. To overcome a 10-mile cross wind change the deflection in the appropriate sense by an amount in mils equal to the number of even thousands of yards in the range.

949. The travel of a target during the flight of a projectile may cause variations in deflection for which correction must be made.

If the line of travel of the target makes an angle greater than 45° with the line of fire, take 5 mils deflection if the target is moving at a walk; 10 mils, if moving at a trot; 15 mils, if moving at a gallop. If the line of travel makes an angle less than 45° and greater than 15°, take one-half of the foregoing deflection. For angles less than 15° make no correction.

If the target is moving to the left, add the correction; if to the right, subtract it.

950. When direct laying is to be used, the initial deflection setting may be fully determined by the foregoing rules.

951. When indirect laying is to be employed, there must also be determined the deflection set-

ting which will cause each piece to be directed upon its target when its line of sight is directed upon the aiming point.

In unfavorable country it may sometimes require considerable ingenuity to direct the guns upon the target. The basis of the method usually employed is to select a common aiming point and to determine the deflection which will cause one of the pieces when laid on the aiming point to be pointed in the required direction. Such a piece is called the **directing piece.** The corrections for wind, drift, and movement of the target are applied with the proper sign to the deflection of the directing piece. A correction is also determined which, applied in arithmetical progression to the deflection of the directing piece, will give for each of the other pieces the deflection necessary to bring its line of fire in the appropriate direction. This correction is called the **deflection difference.**

DEFLECTION DIFFERENCE

952. The principles involved in the determination of the deflection difference are best explained by assuming the target to be visible from the guns. Elementary instruction is best conducted, moreover, with the guns placed so that this will be the case, as a check may then be had on the computations made.

953. If the guns of a battery at normal or other equal intervals are, with zero deflection, laid accurately upon the same part of a target—for example, its right edge—and the lines of sight are then all directed upon a common aiming point, the deflection readings will be found to increase or decrease from right to left by a common difference. This common difference in deflection is termed the **convergence difference.** It is the deflection difference necessary to produce converg-

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ing fire, being positive if the deflections increase from right to left, negative if they decrease.

Note: An increase in deflection moves the muzzle to the left and throws the shot to the left, and a decrease in deflection moves the muzzle to the right and throws the shot to the right.

954. The convergence difference may thus be measured directly if the guns are in position and the target can be seen through the sights. But the data should, in the general case, be obtained before the guns come up. Moreover, when indirect laying is to be employed the target is not usually visible from the guns. Direct measurement of the convergence difference is not then feasible in the usual case. By computation its value may be readily determined as follows:

(a) Determine the parallax of the aiming point and the parallax of the target.

(b) The convergence difference is equal to the parallax of the aiming point diminished **algebraically** by the parallax of the target. It is additive if this algebraic difference is positive, subtractive if it is negative.

955. Assuming the guns to be still converged upon the right edge of the target, their fire may now be evenly distributed over the whole front of the target if we retain the same aiming point for all the pieces and the same deflection for the right piece but increase the deflection of each of the other pieces by an amount necessary to cause its line of fire to be directed upon its appropriate part of the target. The common difference in deflection necessary to effect this distribution is termed the **distribution difference.** Its value is obtained by dividing the front of the target, expressed in mils, by one less than the number of guns in the unit firing. It is always additive, provided the right gun is directed upon the right section of the target, and the difference is applied

in arithmetical progression to the deflection of the right piece to determine the deflection of the other pieces in order from right to left.

956. The algebraic sum of the convergence difference and the distribution difference is the **deflection difference.** If converging fire is to be used, the distribution difference is zero and the deflection difference is therefore equal to the convergence difference.

957. The following nomenclature is used to designate the terms referred to above:

DD	Deflection difference.
CD	Convergence difference.
F	Front of target in mils.
P	Parallax of aiming point.
T	Parallax of target.
X	Number of guns in unit firing.

958. The relations brought out in the foregoing discussion may be expressed as follows:

Rule I: The convergence difference is equal to the parallax of the aiming point diminished algebraically by the parallax of the target; or, CD= DD=P—T.

Note: The result is positive or negative. The sign of P is positive when the aiming point is in front of the line of guns, and negative when in rear.

Rule II: For converging fire the deflection difference is equal to the convergence difference; or, or, DD=P.

Rule III: For distributed fire the deflection difference is equal to the convergence difference increased algebraically by the distribution difference; or, $DD=P-T+\frac{F}{X-1}$

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A special case of distributed fire is **parallel fire.** If the lines of fire are parallel they are directed upon points just a platoon front apart. Therefore,

in the last equation, $\frac{F}{X-1}=T$ and $DD=P$

Hence we have—

Rule IV: For parallel fire the deflection difference is equal to the parallax of the aiming point; or, DD=P.

959. Rule IV affords a quick and ready means of distributing fire, since, to determine the deflection difference, an estimate of the distance to the aiming point and a computation of its parallax are all that is necessary.

960. The foregoing rules afford a method of determining the **deflection difference** necessary to produce either converging, parallel, or distributed fire. If the pieces have a common aiming point and any piece is given a deflection which will cause its line of fire to be directed upon its appropriate section of the target, the desired convergence or distribution may be secured by giving the other pieces the deflection of this directing piece increased (or diminished) by as many times the deflection difference as there are platoon fronts between it and the piece considered.

THE DEFLECTION OF THE DIRECTING PIECE

961. If it is possible to point the directing piece upon its target by looking through the sight, or by occupying an elevated position in rear and looking over the line of metal, then its deflection from an aiming point may be measured. Or, if an observer posted near the position of the directing piece can see the target, he may measure the angle in mils between the aiming point and the target, and this may be taken as the deflection.

By taking post on a tower or ladder, by climbing a tree, etc., the target may sometimes be seen from near the gun.

Or, two men may be posted between the gun and the target so that one can be seen from the gun. The one nearest the crest must see the other and the gun. The one nearest the gun must see the other and the target. By directing one another, these men can establish the line from the gun to the target.

But if the observer must be at a considerable distance from the guns, then the deflection of the directing piece must be secured by measuring at the observing station the angle from aiming point to target and transforming this angle for use at the guns.

962. This transformation may be effected (a) by the parallax method; (b) by the parallel method.

The parallax method is used to best advantage when the observing station is in prolongation of the line of guns and not more than 400 or 500 yards away. It is an extremely quick method, the necessary computations being readily made mentally after facility has been gained.

963. (a) **The parallax method:** To illustrate this method, let it be assumed that the observing station is on the right flank of the guns, in prolongation of their front, and at a distance of *n* platoon fronts from the right piece.

At the observing station the angle A is measured from the aiming point to the right section of the target. This angle may be considered as the deflection necessary to cause an imaginary piece at the observing station to be directed upon the right section of the target; the actual directing piece, *n* platoon fronts away, may be converged upon the same part of the target by increasing (or diminishing) the deflection of the imaginary piece by *n*

times the convergence difference. The process is then altogether similar to that before explained for causing convergence in an established line of guns. We have then

Rule V: The deflection of the directing piece is equal to the angle from aiming point to target, as measured at the observing station, increased algebraically by as many times the convergence difference as there are platoon fronts in the interval between observing station and directing piece; or, $D=A+n\ (P-T)$.

If the observing station is on the right flank, n is positive in the foregoing equation; if it is on the left flank, negative.

964. If the observing station is not on the prolongation of the line of guns, but is in advance of or rear of that line, the interval between observing station and directing piece must be measured perpendicularly to the line joining that piece and the target.

In the latter case the data secured will probably be only approximately correct; but the error in direction should not be great, and errors both in direction and distribution should be readily corrected by subsequent observation.

965. The parallax method thus outlined gives great facility in transforming the deflection, not only from an observing station to a battery, but from battery to battery along a line of guns having a common aiming point. A great variety of special cases will be met in practice, but if the possibilities of the method are fully grasped some adaptation will usually afford a solution. By constant practice in the solution of all sorts of cases facility in the use of the method is to be obtained. The great advantage of the method is that it permits a rough approximation of the direction from gun to target to be quickly furnished. The approximation should be close enough to permit the

first salvo to be observed; errors may then be quickly recognized and corrected.

966. (b) **The parallel method:** Points may be quickly selected, by estimation, in the direction of the aiming point and the target such that lines from the observing station to them will be approximately parallel to lines from the gun to the aiming point and the target. The included angle will be the deflection.

Or, the interval in yards from the observing station to the line from the gun to the aiming point is measured or estimated. The angle at the aiming point subtended by this interval is computed and laid off on the side of the aiming point farthest from the gun. An auxiliary point is there noted on the terrain. Similarly, the angle at the target subtended by the interval from the observing station to the line of fire is determined and laid off on the side of the target farthest from the gun; and an auxiliary point is noted. The angle between lines to these auxiliary points will be the deflection.

For example: The observing station is 100 yards to the left of the directing gun, the aiming point is 4,000 yards to the front, and the distance to the target is 2,000 yards. One hundred yards at 4,000 yards corresponds to 25 mils and 100 yards at 2,500 yards corresponds to 40 mils. Starting at a point 25 mils to the left of the aiming point, measure to a point 40 mils to the left of the target. This angle is the deflection of the directing piece. If the aiming point is very distant and the displacement from the gun is not great the correction at the aiming point may be disregarded.

967. The special advantage of an aiming point common to all the guns is that the officer conducting the fire may then most simply calculate and establish the direction and distribution of his fire.

968. If an aiming point visible from all the guns and from the observing station cannot be found, then some expedient must be devised for directing the guns upon their targets. The following are given as examples of such expedients:

Example 1: The guns are in a depression and all view of the surrounding country is cut off. No natural aiming points are available. The battery commander, mounted on an observing tower, can see the target provided his tower is placed in rear of the third piece.

Solution.—The captain places his tower in rear of the third piece and, looking over the line of metal, directs the gun upon its appropriate part of the target.

He causes the gunner of the third piece to turn his panoramic sight upon the centers of the rammer staffs held vertically at the sights of each of the other pieces in turn and to read off the corresponding deflections. For pieces to the right of the third piece this deflection is increased 3,200; for pieces to the left it is diminished by 3,200. The resulting deflections are in each case set off on the sights of the respective pieces, and they are then laid, using the sight of the third piece as an aiming point. **Parallelism** of the lines of fire is thus secured.

The deflection of each piece may then be measured from an artificial aiming point.

Example 2: Suitable aiming points can be seen from the guns, but none of them are visible from the observing station which, on account of the lay of the ground, must be placed about 400 yards to the flank of the guns.

Solution.—The battery commander decides to designate his telescope as a temporary aiming point. He determines the deflection of the directing piece as follows:

(a) Sets the telescope at 3,200, directs it upon the sight of the directing piece, and clamps the lower limb; unclamps the upper limb, directs the telescope on the target, and reads the angle.

(b) Measures or estimates the interval in yards between telescope and gun, divides this amount by the number of thousands of yards in range to target, and thus procures the angle in mils at the target subtended by the interval between telescope and gun.

(c) Adds this angle to the angle measured by the telescope if the telescope is on the left of the guns, subtracts it if the telescope is on the right. The result is the deflection to be used by the directing piece, the telescope being the aiming point.

Setting off this angle on the sight of the directing piece and using the telescope as an aiming point, the piece is laid on the target. The direction of this piece may then be referred to any suitable aiming point. By computing the deflection difference in the usual way, the deflection to be given the other pieces may then be determined.

969. The captain may have to occupy an observing station such that the data for computation cannot be obtained.

Example: The executive has established the sheaf of fire in the general direction of the center of the sector assigned.

Solution.—The captain causes a single round to be fired from one of his interior pieces and corrects the deflection in accordance with the observed result.

970. The situation may be such that the pieces must be scattered at irregular intervals and without regard to alignment. The sheaf may be formed by the method described in paragraph 820.

971. When battery salvos are used, the second (third) piece should be taken as the directing

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piece and its deflection calculated for the right (left) of the target.

When platoon salvos are used, the first (fourth) piece should be the directing piece, its deflection that for the right (left) of the target.

972. When the deflection and deflection difference have been calculated under conditions exceptionally favorable to accurate results the computed data should be used. Otherwise the initial deflection or initial shift is best announced as the multiple of 10 nearest to the determined value; and, except against very narrow targets, the initial deflection difference as the multiple of 5 nearest to a value determined by increasing algebraically by 10 the parallax of the aiming point.

THE SITE

973. The **site** is the angle between a horizontal plane and the line from the gun to the target. It is measured in mils and a difference of one mil in site corresponds to a difference in level between the gun and the target of one one-thousandth of the range.

974. The correct determination of the site is important in the resultant saving of time and ammunition and in the production of effect during fire for adjustment.

If the target is visible from the position of the guns, the site may be measured there. If the target is not visible from the position of the guns, the site may be measured at the observing station and transformed, if necessary, for use at the guns.

In open country the site may often be estimated with sufficient accuracy by referring the site of the target to a distant horizon the site of which is ordinarily 300.

975. If the observing station and the guns are at approximately the same level, and at approxi-

mately the same distance from the target, the angle measured at the observing station is used without change at the guns.

976. If the observing station is near the guns, but at a different level, the angle measured at the observing station is corrected, as follows: Estimate the difference of level in **yards** between observing station and guns; convert this difference into **mils** by dividing the number of thousands of yards in range to target and apply the result with the proper sign as a correction to the site of the target as measured at the observing station.

Example:

Site measured at observing station..= 320 mils.
Estimated height of observing station above guns.....= 30 yards.
Range of target (measured or estimated) .....=3,300 yards.

$$\text{Correction}=+\frac{30}{3}=+10 \text{ mils}$$

Site at guns=320+10=330 mils.

977. If the distances to the target from the observing station and the guns materially differ, the angle measured at the observing station is corrected as follows: Determine the difference of level in yards between observing station and guns (Lg) and between observing station and target (Lt) by measuring the difference of level in mils, and converting this difference into yards by multiplying it by the number of thousands of yards in the distance from observing station to gun or target. Determine the difference of level in yards between gun and target by taking the sum of the foregoing differences if the observing station is at a level intermediate between the gun and target, by taking their difference if the observing station

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is above or below both the gun and target. The result is affected with a positive sign if the gun is below the target, with a negative sign if the gun is above the target; and it is then converted into mils by dividing by the number of thousands of yards in range. Applying this correction to 300 with the proper sign, the site at the gun is obtained.

The operations to be performed in effecting this transformation are set forth in detail in the Field Artillery Data Book.

Example:

Difference of level between observing station and gun, in mils.....(Lg) = —50
Difference of level between observing station and targets, in mils.....(Lt) = +10
Distance from observing station to guns, in yards.....(BG)=1,200
Distance from observing station to target, in yards.....(BT)=4,500
Distance from guns to target, in yards(R) =3,000

$$Lg = -50 \times 1.2 = -60$$
$$Lt = 10 \times 4.5 = 45$$
$$SI = 300 - \frac{Lg - Lt}{\frac{R}{1{,}000}} = \frac{-60 - 45}{3} = 300 + 35 = 335.$$

978. Except where instruments are known to be in exact adjustment and ample time is available for calculating data, the site should be given in terms of the nearest multiple of five.

979. If a very broad target sloping sharply at right angles to the plane of fire is to be attacked, it will generally be necessary, in order to secure exact adjustment of the fire, to vary the sites by a common difference from one flank of the line of

guns to the other. The value of this common difference may be determined by finding the difference in site between the two flanks of the target and dividing this difference by one less than the number of guns firing.

980. A change of site does not change the range to the point of burst in air, but increasing the site raises the point of burst in time fire and lengthens the range in percussion fire, while decreasing the site lowers the point of burst in time fire and shortens the range in percussion fire.

PERCUSSION FIRE

981. Percussion fire is principally employed for the destruction of material objects, such as walls, buildings, obstacles, artillery matériel, etc. Such fire is termed **fire for demolition.** It is also appropriate for fire against troops in woods or in confined spaces.

For the destruction of artillery matériel or other targets of low relief, light field guns may be used, but such use at ranges exceeding 2,000 yards requires the expenditure of much ammunition.

TIME FIRE

982. Time fire is employed for the attack of animate objects and aircraft, and gives more incendiary effect than percussion fire.

CORRECTOR

983. The corrector setting should be such as will cause the mean point of burst to be about 3 mils high during fire for effect; about 1 mil high during fire for adjustment.

Due to variations in powders and fuse compositions and to atmospheric conditions, and to errors in the determination of the site, the most suitable corrector must be determined in each individual instance. Hence, at the commencement of fire,

a trial corrector must be taken. This trial corrector is such as is suggested by previous experience with the ammunition in use and with local atmospheric conditions.

METHOD OF FIRE

984. In deciding upon the number of guns to be employed, the captain should consider the nature, size, importance, and range of the target to be attacked, the conditions of observation, the firing data already determined by previous fire, the supply of ammunition, the tactical situation.

985. Fire by battery has the advantages of increasing the chances of discovering abnormal errors of gun service and of observing more than one round, thus establishing quickly the basis for changes of direction, height of burst, and range. When the range has been accurately determined it increases the probability of obtaining both shorts and overs at the first salvo and effect on a wide front of the target. It also has the advantage of at once setting all of the trail spades.

Fire by platoon has the advantage of simplifying analysis of the observation of individual bursts with respect to range, distribution, and height of burst, and of saving time in the launching of each salvo. It requires somewhat less ammunition than by battery and, in some cases, may increase the percentage of rounds correctly observed for range.

Fire by piece is appropriate to check a very doubtful deflection and, in some cases, for fire for registration.

986. Salvos insure the identification of individual rounds and, with the exception of distribution, more accuracy in observation of fire. They are favorable to accurate service of the piece.

Volleys are faster than salvos and give better observation of distribution.

987. Salvos usually commence on the leeward flank of the guns, in order that the burst of one round may not be obscured by the smoke or dust of the other.

RANGE

988. The initial range may be determined by means of a range-finding instrument, by angle-measuring instruments, and a measured base, by the use of maps, by sound, by estimation, from auxiliary observers, from previous fire, or from other units. Every auxiliary means, time permitting, should be employed to assist in the measurement of the range, since its correct predetermination is essential to promptness of effect. In many cases an officer must rely upon his own estimate of the distance. By constant practice it is possible to gain the ability to estimate distances closely, and it is imperative that artillerymen should acquire this ability. In such training distances should be estimated to permanent features of the terrain rather than to targets known to have been arranged for service practice.

SUMMARY

989. In determining the data for indirect laying, the following is a summary of the operations which may be carried out when an observing station on the flank of the guns must be taken and a suitable one can be found within 400 or 500 yards of the guns.

1. Select an observing station from which a good view of the target and its surroundings may be obtained which is as close to the guns as the conditions permit and which is as nearly as possible on the prolongation of their front.

2. Select an aiming point which is surely visible from all the guns, whose direction is as nearly normal to front as possible and whose distance from them is preferably not less than 2,000 yards.

3. Measure the angle from aiming point to target, the site, and the front of the target in mils.

4. Measure or estimate the distance to aiming point and to target and compute the parallax of each. Correct the parallax of the aiming point for obliquity if the line from the directing gun to the aiming point makes an angle greater than 400 mils with the normal to the front of the guns.

If the observing station is at a considerable distance from the front of the battery prolonged, the parallax both of the aiming point and the target must be determined with reference to a platoon front on the line **station-directing piece** for use in computing the deflection of the latter and with reference to a platoon front in the battery for use in obtaining the deflection difference.

5. Determine the convergence difference by Rule I, estimate or measure the distance to the directing piece and apply Rule V for the determination of the deflection.

6. Determine the deflection difference by Rules II, III, or IV.

7. Correct the site, if necessary, for difference of level between observing station and guns, adopt the corrector which previous fire has shown to be the most suitable, and take the range as measured or estimated.

Observation of Fire

990. The officer conducting the fire, unembarrassed by details of the service of the guns, and assisted by members of the battery commander's detail, should devote himself to observing and correcting the fire and adapting its employment to meet the requirements of the situation. He should train himself to form accurate and quick estimates and to act on them with decision and boldness.

991. To overlook ground which is invisible to the officer conducting the fire and to assist gen-

erally in the adjustment of fire, free use is to be made of auxiliary observing parties.

992. Such parties occupy the most favorable observing stations which the conditions of the combat admit. Preferably they are as near the enemy as possible.

993. Their special duties are to furnish information which will assist in the adjustment of fire and to keep the Artillery commander informed of movements of the targets or of our own troops which would affect the employment of fire.

994. With respect to the adjustment of fire, they indicate especially whether the range is **short, over,** or **correct**; whether the **burst interval,** when in front of the target, is too **great,** too **small,** or **correct**; whether the direction is **right, left,** or **correct.**

If large errors in range are made, an observer on the flank of the guns will not usually be able to separate the errors in range from those in direction; in such a case the observer would ordinarily signal the direction only, as **right** or **left,** as it appears to him, and the officer conducting the fire, knowing the position of the observer, would deduce the sense of the salvo, volley, etc., in range. If the observer is to the right of the line of fire, shots striking short of the target appear to be to the **left,** while those striking **over** appear to be to the right, and vice versa if he is on the left of the line of fire.

995. With respect to movements of the enemy, the observer reports especially: If the enemy abandons his position; if he shifts to the right or left, front, or rear to escape effective fire; whether hostile reenforcements enter the sector and their location.

996. With respect to our own troops, the observer makes such reports as to their movements

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and situation as will enable the artillery commander best to assist them with the fire of the guns.

997. Arrangements should, moreover, be made to obtain from advanced troops information which will assist in the adjustment of fire, and indication as to when fire should be commenced or discontinued.

998. Sure and definite means of communication must be established between the artillery commander, his observing parties, and advanced friendly troops. If time and material admit, wire communication is provided, but visual signaling must always be relied upon to a greater or less extent.

999. For observation of fire, for study of the terrain, and for the quick recognition of objectives, good field glasses are indispensable. All officers, agents, signalers, and scouts of field artillery should be equipped with suitable glasses and should be skillful in their use. A monocular glass is not suitable for observation.

1000. Correction of fire is based on observation of bursts in air or on impact, and of effect upon the target or upon the terrain.

BURSTS IN AIR

1001. A burst in air produces a ball of smoke which ordinarily remains together for an appreciable time.

1002. When the shrapnel bursts, the smoke, white or light gray in appearance, is projected in the direction of the trajectory. The point of burst is therefore always above the center of the smoke ball. At ranges beyond about 2,000 yards the point of burst is near to or above the summit of the smoke ball, and the latter, observed from near the plane of fire, is seen in a pear-shaped form, small end uppermost.

1003. When viewed from a flank, the direction of the smoke ball outlines the trajectory to a greater or less extent. The smoke from a group of shots, when viewed from a flank, usually will give a definite idea as to the point at which the mean trajectory meets the ground.

1004. An air burst after ricochet gives a pear-shaped smoke ball, with the broader end up.

1005. Occasionally a burst in air close to the ground will give a flattened smoke ball discolored by dust or mud in considerable quantity, caused by the impact of a large number of bullets on a small area.

BURSTS ON IMPACT

1006. When a common shrapnel bursts on impact the smoke ball is discolored and fugitive, its upper portion wide and irregular but somewhat flat.

1007. When a shell or high-explosive shrapnel bursts on impact a large irregular columnar mass of black smoke and dirt forms, which remains visible for some time.

1008. The bullets and fragments from a burst in air knock up a considerable amount of dirt and dust if they strike dry soil; on wet soil splashes of mud are knocked up by the shrapnel case and large fragments. Occasionally the effect of bullets and fragments may be observed in the flattening of long grass or in the movement of brush or tree branches.

1009. An air burst of high-explosive shrapnel is followed by a percussion burst of the head. This ammunition, therefore, affords opportunity to obtain more information than does the common shrapnel or shell. Care should be taken to distinguish the impact burst of the head from a graze burst of the whole projectile.

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DIRECTION

1010. Errors of direction of the sheaf of fire as a whole or of individual rounds may be measured; if small, they may usually be estimated with sufficient accuracy by eye.

The measurement or estimation of these errors may best be made when the observer is near the line joining gun and target; viewed from the flank, the error in direction is complicated with that in range, and its observation is particularly subject to inaccuracy when the shots are fired at ranges sensibly different from that of the target.

HEIGHT OF BURST

1011. The height of a burst is measured or estimated from the bottom of the target to the point if the target is not concealed in trenches or behind a crest; otherwise it is measured from the summit of the covering crest.

1012. The height of a group of bursts is the mean of the individual heights of burst.

1013. In estimation, the observer may often refer the burst to some convenient point in the terrain, the angular distance of which above or below the bottom of the target or the covering crest has previously been determined.

1014. For convenience, bursts are classified as follows:

Graze: Bursts on impact.

Below: Air bursts below the target.

Graze below: Graze bursts below the target.

Low: Air bursts from zero to 2 mils above the bottom of the target.

Normal: Air bursts from 2 to 4 mils above the bottom of the target.

High: Air bursts from 4 to 6 mils above the bottom of the target.

Very high: Air bursts more than 6 mils above the bottom of the target.

1015. Inaccuracy of observation is to be avoided by prompt decision upon a consideration of the formation and normal appearance of the smoke ball. Such inaccuracies are the sensing of bursts in air as lower than they actually are, due to sensing on an inappropriate part of the smoke ball; to the sensing as **low** of **graze** or **below** bursts; and to the sensing as air bursts of **bursts** after ricochet.

RANGE

1016. It is rarely possible from a position near the guns to estimate with accuracy the amount of the error in range. Such estimates are usually too small and cause delay through an effort to correct the fire by making timid and insufficient changes in the range.

Attention should rather be concentrated on deciding, from careful observation of each shot, upon the sense of a number of shots fired with the same range and site, and on quickly inclosing the target with fire which is surely short and fire which is surely over. By narrowing the bracket thus determined effective adjustment may be secured.

A **salvo** or **volley** is considered **short** if all of the observed bursts are short; **over** if all of the observed bursts are over; **bracketing** if half of the observed bursts are over; **mixed** if the majority of of the observed bursts are over and the minority are short, or **vice versa.**

The observer should train himself to decide quickly upon the sense of each shot as **short, over,** or **doubtful,** and upon the sense of each group of shots as **short, over, bracketing, mixed,** or **doubtful.** It may be necessary, however, to allow time for the smoke to form and reveal its relative position with respect to the target.

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If the sense of a shot cannot be definitely decided upon, it is doubtful, and should be disregarded.

1017. The most accurate sensing of range is based on observation of effect on the target. Such observation will be more often possible in war than in peace. Next comes observation of bursts on impact, then of effect on terrain, then of the position of the smoke ball with respect to the target.

1018. Frequently irregularities of the ground or its nature prevent the observation of graze bursts so that low bursts in air must be sought. This is the usual case.

1019. If the observer is considerably above the target, or the target is on ground sloping toward the observer, the sense of a salvo (**short** or **over**) may usually be recognized readily by noting the relative position with respect to the target of graze bursts of the projectile or of the head of high explosive shrapnel or of fragmental hits from bursts in air.

Information obtained from the observation of the effect thus produced is reliable when it is observed as **over**; it should be accepted with caution when observed as **short**, unless the burst is **low.**

1020. In certain cases, such as in fire against air craft, fire at night, fire against marked targets, range sensing will be either extremely difficult or impossible from the vicinity of the guns. Recourse is then had to lateral observers.

The more uncertain the direction of fire or the greater the range of the target, the greater should be the distance of the observer from the line of fire.

1021. Observations of range from lateral positions are complicated by errors of direction. But if the direction is correct all shots seen by the

flank observer will be over if they are on the side of the target corresponding to his side of the line of fire, and short if they appear on the opposite side of the target.

Observation of Terrain

1022. An accurate conception of the terrain in the vicinity of the target increases the number of rounds which may properly be called sensible. Preparatory to opening fire the study of ground forms around the hostile positions should be taken up, and this should be continued during the action. Auxiliary observers may give valuable information. If maps are available, they should be studied and used. Practice in making position and place sketches and a comparison of the sketches with the actual terrain will increase facility in judging ground from a distance.

1023. It is necessary to locate ravines or hollows which might catch and hide the bursts. The smoke from such bursts is apt to rise and reveal itself after a time, but false deductions may be drawn from it. Thus, the smoke from a burst short of the target may have become so much dissipated by the time it appears that the target may be seen through it and the impression produced that the target is silhouetted against the smoke. Moreover, if a strong cross wind is blowing, the smoke, when it appears, will probably be at some distance to the flank of the actual point of burst, and erroneous conclusions as to the direction of the salvo may thus be reached. Such false deductions may be avoided, however, if the lay of the ground is appreciated and considered.

1024. The existence of unexpected ravines and hollows may sometimes be deduced during firing from the fact that while bursts in air are seen the points of impact of the fragments are not revealed by the dust and dirt knocked up.

1025. Indistinct targets whose location is only approximately known will sometimes be disclosed by bursts beyond them. It may be advisable to search for such targets by firing at varying ranges and deflections. Volleys and salvos with a wide distribution will often favor this purpose.

Observation from Aircraft

1026. The study of terrain and the location of targets with but overhead concealment by observers in aircraft are very practicable.

Large sausage-shaped captive balloons are successfully used for this purpose. They are fixed at altitudes of 400 to 1,000 yards. The observers are equipped with telephones and powerful glasses. They are usually guarded by mobile aircraft stationed near by. Satisfactory results cannot be obtained with these balloons when the wind is blowing hard.

The designation of objectives is difficult. It is possible, however, by several methods, such as by photography, by sketches, by reference to squared maps, by description, by their relation to reference points. Range and direction may be approximately determined by use of the range finder and the aiming circle or telescope in observation on a mobile aircraft at the moment when a prearranged signal indicates that it is over the target.

1027. In observation of fire from a great height, bursts in air and bursts on graze may both be seen; but it is difficult to judge the height of the burst center except by the ratio between the numbers of air bursts and graze bursts. In both range and direction the relation of the shots to the target is easily determined.

Effect from shrapnel bullets can not be observed.

1028. Communication from mobile aircraft is reliable only when radiotelegraphy is used. A spe-

cial code is used for this purpose. In the absence of such means it will be necessary to use written or phonographic messages dropped to the ground; to the notes of a high-pitched horn at short distances; to colored lights, as from a Very pistol; to mechanically projected dots, dashes or streamers of black powder; to certain evolutions of the aircraft; or to other prearranged signals.

Signaling to mobile aircraft is reliable by means of strips of white cloth, about 20 yards long and 2 yards wide, fastened to the ground in conventional geometrical figures.

1029. Communication to and from captive balloons and kites should be by wire.

VII

Engineer Troops and Military Field Engineering

Engineer Troops

1030. Military field engineering may be defined as the art of utilizing the terrain and constructive materials at hand for the progress, safety, effectiveness, health, and comfort of military forces in the field. In brief this means the most effective location and construction of intrenchments and fortifications, and sometimes the destruction of the same, the construction, repair, or destruction when required, of roads, railways, bridges, obstacles, shelters, and buildings for the use of troops in the theatre of operations.

The most technical problems belong to the engineers who are organized, trained, and equipped for this work. Engineer officers must be educated along general engineering lines, and must be practical constructionists. They must have a thorough knowledge of the tactics and functions of the other arms in order to assist them in the accomplishment of their duties. Likewise, all combat officers should understand the functions, powers, and limitations of the engineers for work, and particularly should the commanders of the forces learn to use them to the best advantage.

The enlisted men of the engineer organizations should be of an exceptional order. The majority should be selected men from the various crafts and trades, and the noncommissioned officers of the higher grades must be thoroughly trained in

the various engineering duties; they should be practical and of considerable executive ability, since in war they are usually called upon to direct the work of large bodies of men in the construction of field works.

1031. The duties of the Corps of Engineers in our service are numerous, and include, in peace times, the execution of river and harbor improvements, military surveying and map making, selection of sites and preparation of plans and estimates for military defenses, construction and repair of fortifications and their accessories, and in addition, in times of war, reconnaissance, the planning and direction of military works in the field, demolitions, sapping and mining operations, location, construction and repair of military roads, railways, bridges, ferries, wharves, piers, landings, storehouses, hospitals, the operation of railroads under military control, and the construction and operation of armored trains.

1032. While engineer troops are in the technical sense, auxiliary to the combatant forces, they are also troops of the line and in our service are armed, equipped, and trained as infantry, since they must often serve as infantry in protecting themselves and their works as outlined above. They are often sent out alone on reconnaissance, and must often accompany advance, rear, and flank guards or the leading troops in attack, on which occasions they must carry the necessary demolition and pioneer tools, explosives, bridge materials, barbed wire, etc., as the case may be, for either destructive or constructive work.

1033. Our last organization provided for one battalion of three pioneer companies for each infantry division, a mounted battalion of three pioneer companies for each cavalry division, and, in addition, a pontoon battalion of three pontoon companies (one light and two heavy) for each

field army. The results of the present war in Europe have demonstrated a greater demand for engineer troops, and it is very likely that the new organization will provide for a regiment of two battalions of three pioneer companies for each infantry division and probably more for each field army.

1034. All line troops are now supplied with tools for the construction of their own hasty field works, and they must be thoroughly trained in the preparation of the same. In view of the limited number of engineer troops available in an army, the line between the duties of the engineers and other arms should not be drawn too closely. The other arms should acquire all the engineering knowledge and skill possible, and should be taught to make full use of the terrain and resources of the country, calling upon the engineers to solve only such problems as they are not equipped to handle. However, at the beginning of a war the engineer troops will necessarily be called upon to instruct untrained troops in field engineering and supervise their field works.

1035. All officers of the line should be educated in the principles of military field engineering and have a practical knowledge of the expedients of the same. They should thoroughly understand the principles governing the selection of defensive positions, the location and construction of hasty intrenchments, of fortifications and field works and their concealment. They should understand also the construction of roads and simple forms of bridges, demolitions and mining operations.

Field Fortifications

1036. In a military contest both sides strive for strategical and tactical advantages, the tactical or local advantage leading up to the former. In order to succeed, the power to maneuver must be

maintained, either strategically or tactically; a suspension of this power at once calls for intrenchment, and usually every means is adopted to hold the position until this power is regained. As Lieutenant von Harvath has said: "Trench warfare results from a tactical deadlock." And again: "Troops dig because they are forced to halt; they do not halt to dig." (Normand.) All other things being equal, the side which makes the better use of the ground and cover, both natural and artificial, for the protection of its troops should win.

During actual combat the desire for protection becomes second nature, though during peace training and maneuvers it is difficult to obtain a full and serious use of cover on the part of troops.

1037. The general term fortification means the artificial strengthening of the ground or terrain for military purposes. Several reasons may require a resort to fortifications, but in general the object is to enable a force to hold its own against superior numbers. This means of course that the soldier is enabled to use his rifle with greatest effect and safety to himself.

While fortifications are generally resorted to for defensive purposes, it must be borne in mind that field fortifications may, and should be, used in offensive operations. The object of the infantry attack is to close with the enemy and obtain the earliest decision, therefore intrenchments must be resorted to only when farther advance is impracticable. This may be due to fire superiority of the enemy or to fatigue on the part of the troops of the advance. When the halt is necessary, the ground should be held and intrenchments must be made on the spot by the troops with the tools carried for the purpose. The troops should, however, be trained to the full realization of the principle that the advance must be resumed

at the earliest moment. If not, the use of field fortifications may lower the morale and injure the offensive spirit of the troops.

1038. Fortifications may be classified as strategical or tactical, the former usually constructed in times of peace are more permanent in nature. Tactical fortifications are those constructed by the troops during active operations, the usual beginning of this type being the hasty intrenchments constructed under fire with the intrenching tools carried on the person. These hasty intrenchments go deeper and stronger in a short while if a tactical deadlock ensues; and, as shown by the war in Europe, they may soon assume the form of semipermanent fortifications.

1039. Fortifications may also be classified in degree as permanent, semipermanent or provisional, and field. As indicated by their names, the first type is usually designed and constructed in peace times at important strategical points; the second includes works of less permanency, constructed either before or after war; the third type, the field fortification, temporary in nature, is constructed either on the firing line or beforehand in the immediate theater of operations. It is this type which we will consider in this chapter.

1040. Field fortification may be divided into **hasty intrenchments, deliberate intrenchments,** and **siege works. Hasty intrenchment** includes devices resorted to by troops upon a battle field to increase or prolong their fighting power, usually constructed in the presence of the enemy and in haste. **Deliberate intrenchment** comprises works constructed by troops not in line of battle for the protection of depots, lines of communication, supply, or retreat, etc. As they are usually intended to enable a small force to resist a much larger one, they are more carefully designed than hasty intrenchments and have greater defensive strength.

Siege works comprise devices used by besiegers and besieged in the attack and defense of strong fortifications, and especially those devices which enable troops to advance under continuous cover.

The lines of division of the three classes are **not definite.** Some devices may belong to more than one class, and a work begun in one class may be merged into and be completed in another.

1041. Protection from fire or view is usually called **cover.** Protection from fire is divided into **horizontal** and **overhead** cover. **Horizontal cover** gives protection against direct or horizontal fire. It usually takes the form of a shot-proof barrier, vertical or nearly so. **Overhead cover** gives protection against indirect or high-angle fire, and against the fragments of shells and shrapnel bursting overhead. It ordinarily takes the form of a shot-proof barrier, horizontal or nearly so. Overhead covers are often referred to as **bombproofs** or **splinter proofs**—the latter if they are light, but proof against rifle fire or fragments of shell or shrapnel, the former if they are strong enough to resist the curved and vertical fire of siege guns and mortars. The term **splinter proof** is also applied to horizontal cover thick enough only to stop fragments of shell or shrapnel.

1042. There are three general types of trenches which apply in all classifications of fortifications; they are: (a) Fire trenches, in which the men fight; (b) cover trenches, in which the supports and reserves rest in safety from fire and weather; and (c) communicating trenches, connecting the fire and shelter trenches for the safe passage of the troops.

These three types are wonderfully amplified in Europe to-day, where trench warfare has assumed an importance never dreamed of before. It has in fact become a separate and distinct branch of the military art.

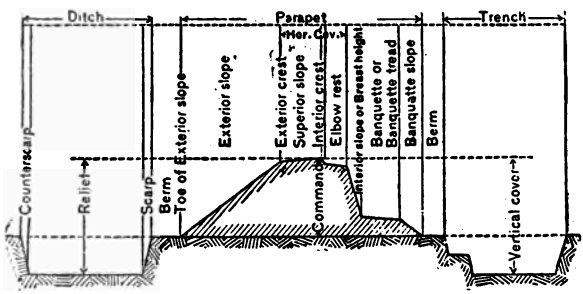
The firing trenches are deep, narrow, and well concealed, and form a continuous line, traversed every 10 or 15 yards as a protection against enfilade and to localize the effect of high explosive shell. Sometimes they consist of two or more echeloned lines of short, deep trenches or pits, 8 or 10 yards in length, at intervals of 6 or 8 yards. The lines are 2 or 3 yards apart longitudinally. The pits in rear cover the intervals in the front line. This plan avoids the labor of constructing traverses, while giving the same effect with increased strength. If occupied for any length of time the pits are linked together. The losses due to high explosive shell are limited, as the pits are occupied by only 4 to 6 men each.

The cover or shelter trenches are located near the fire trenches and are deep and narrow. They are covered with timbers and a deep layer of earth. The troops live in deep bombproof dugouts leading off of these trenches and sometimes extending 20 to 40 feet below the surface. Some of these dugouts even have modern conveniences, including electric lights. Drainage is sometimes accomplished by elaborate pumping systems. Deep covered trenches lead from the cover trenches to the fire trenches. The front is strongly protected by wire entanglements and other obstacles, open spaces, amply covered by machine guns, being provided for the advance. Machine guns are placed in the front line every 12 or 15 yards and in elevated places in rear where they can cover all open communication trenches. Artillery observation stations are placed in favorable positions as near the front as possible.

Ample provision is made for telephone and telegraph communication between sections of the line, between tactical units and their commanders, and between the observers and the batteries in the rear.

In each defensive position two or more, sometimes as many as six, complete lines of these trenches are thus constructed as a safeguard against the loss of the first lines. The areas thus defended sometimes cover belts 2 to 4 miles wide.

1043. Profiles: A profile is a section of any cover made by a vertical plane perpendicular to its general direction. The diagram below is a profile intended to show the nomenclature used in fortification. It is not intended to represent a type profile for any other purpose whatever. In dimensioning a profile the plane of site is taken as



the plane of reference. The distances of points of the profile from this plane are stated in feet and fractions; those above with the plus sign and those below with minus sign. The quantities are inclosed in parentheses and are called references.

The form of the profile is in general governed by the shape of the ground, i.e., whether level or inclined, the character and condition of the soil or earth, that available for revetments, facilities for concealment, and time for preparation.

The interior slope should be vertical and if necessary boards or other revetments should be used to keep it so. If practicable it should be undercut in front so as to permit the men to sit or

crouch in safety from shell fire. The deeper and narrower the trench the safer it will be from shrapnel and shell fire. The occupants should be able to walk along the trench in safety and steps or platforms should be provided for men in the firing position. Steps should be prepared in the walls to permit hasty exit to the front.

The thickness of the parapet is regulated by the kind of fire and concealment afforded by the site. Where little concealment is available, the superior and exterior slopes should join and form a gentle slope to the front or the top surface should be almost flat. Low visibility is one of the greatest protections for a trench and adds greatly to its strength. In making the parapet it must be remembered that 3 feet of ordinary earth is required to resist the rifle or machine gun bullet. A safe rule for the soldier to remember is to make the width of the parapet equal to the length of his rifle. Earth and sand are the best materials for the parapet. The excess earth should be scattered both in front and in rear of the trench and covered with sods, leaves, or grass.

The thickness required to resist artillery fire will vary from 9 to 20 feet, but the construction of such parapets is impracticable under fire. Concealment is the best protection against artillery, and if the cover gives protection against rifle fire the greater part of the danger will be overcome.

1044. The position: In combat the troops on the defensive have the advantage in the selection of the position and also in the perfection of the trenches. The attack advances, and if it cannot close with the enemy and take his position, it must intrench as near it as possible. The men first take advantage of such cover as the locality affords, behind embankments, rocks, trees, logs or buildings, in ditches, furrows, or other depressions, but

where the ground is flat and bare each man must first scoop out a depression in which he can lie until darkness or other opportunity permits his movement. After darkness the position should be greatly improved and strengthened. The line may if necessary be reorganized from the observations made during the daylight.

In the selection of the ground and in the preparation of the trenches the following rules should govern as far as practicable:

(a) The site should give a free and unrestricted use of the weapon.

(b) It should give the greatest amount of protection with the least amount of labor.

(c) It should give a clear field of fire of from 150 to 350 yards toward the enemy, and more toward the flanks if they are exposed.

(d) It should give the greatest amount of concealment from the enemy.

(e) It should afford good positions in rear for the supports and reserves with easy routes for communicating trenches to the fire trenches.

The effectiveness of the rifle fire should first of all govern the selection of the trace of the line of intrenchments. The military crest affords the best view to the front, but ordinarily it has the disadvantages of less concealment, better target for the hostile artillery, less fire effect due to dead spaces and plunging fire. A low site gives better concealment and a grazing fire, and if the width of the field of fire is sufficient, it is preferable, provided, cover and communications for supports and reserves may be had to the rear. A position on a rising slope below the military crest is probably the best compromise, as it gives the advantages of good view and concealment. If placed low enough, several tiers of trenches may be provided in rear, the preparation of which will be necessary if a deadlock ensues.

CONSTRUCTION OF HASTY INTRENCHMENTS

1045. In constructing trenches officers should bear in mind that profile and construction are simple matters compared with location and correct tactical use of trenches.

The trace of a fire trench or of a system of fire trenches depends upon the ground and the proposed density of the entire firing line. The trenches are laid out in company lengths, so that the organization may remain intact, if possible. They are not, however, constructed in one long open length, but are divided into a series of short sections by means of thick traverses, each section providing cover for not more than six or eight men. The crests of the traverses should be of the same height as the parapet.

Adjoining trenches should afford each other mutual support. The flanks and important gaps in the line should be protected by fire trenches echeloned in rear. (Fig. 6, page 420.)

To locate the trace, lie on the ground at intervals and select the best field of fire consistent with the requirements of the situation.

A profile should be selected which will permit the fire to sweep the foreground, require the minimum of labor and time, and permit the best concealment. No fixed type can be prescribed. The type must be selected with due regard to the terrain the enemy, time, tools, materials, soil, etc.

With the intrenching tool, troops can quickly throw up a low parapet about 3 feet thick which will furnish considerable cover against rifle fire, but scarcely any against shrapnel. Such cover is frequently of value to an attack that is temporarily unable to continue.

As a general rule the trace of a parapet should follow the lines of best natural cover or those which determine the strongest natural position.

In practice, it usually happens that the troops are located with a view to taking full advantage of the features of natural strength, and the fortifications are thrown up where they are to give them additional protection.

The interior crest should be horizontal, and hence the crest should, as a rule, follow a contour. Generally, a broken line will approach the contour near enough and will be easier to lay out and construct. If the contour curves sharply the trace should curve also. Angles must be rounded off to make them less conspicuous, and at the beginning and end of a trench its bottom should gradually rise and the parapet fall to nothing for better concealment.

The particular contour to be chosen depends upon local conditions.

When intrenching under fire, cover is first secured in the lying position, each man scooping out a depression for his body and throwing the earth to the front. In this position no excavation can be conveniently made for the legs, but if time permits the original excavation is enlarged and deepened until it is possible to assume a sitting position, with the legs crossed and the shoulder to the parapet. In such a position a man presents a smaller target to shrapnel bullets than in the lying trench and can fire more comfortably and with less exposure than in the kneeling trench. From the sitting position the excavation may be continued until a standing trench is secured.

1046. Fire Trenches: The accompanying sketch shows in profile some of the more common forms considered as satisfactory before the present war, but the present tendency is to make them narrower and deeper with the walls as nearly vertical as possible and without elbow rests. The trenches may be kept dry by providing sumps at the ends or at convenient intervals and covering the bottom

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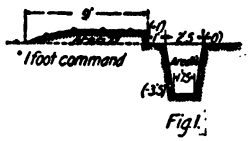
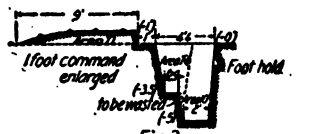
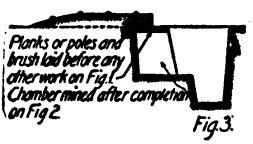
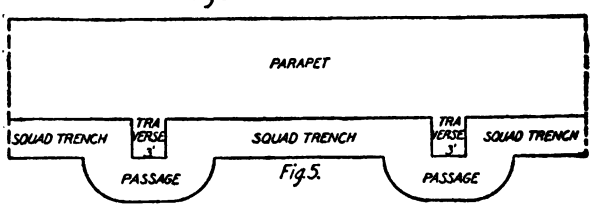
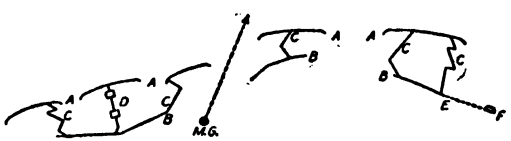
with brush or a loose floor. Figure 1 is the simplest form of standing trench. It can be constructed with intrenching tools in ordinary soil











Possible arrangement of 2 Bns. of Inf. intrenched (Regimental Reserve of 1 Bn. not shown)

A. Firing trenches.
B. Cover trenches.
C. Communicating trench; D same traversed; E communicating way
F. Closed supporting point for flank protection
MG. Possible position for machine guns, concealed from front

Fig 6

in about two hours by working two shifts and tasks of 5 feet each. This trench affords fair cover for troops subjected to fire, but not actually firing. When it is probable that time will permit elaboration, the simple trench should be planned with a view to developing it ultimately into a more complete form. (Figs. 2 and 3.) Devices should be added to increase the security of the trench and the comfort of the men. Figure 2 shows the same trench deepened in rear, so as to allow men to walk along in the rear (deeper) portion of the trench without exposing their heads above the parapet. Figure 3 shows a cover and firing trench, with a chamber in which men can find shelter when under artillery fire.

Where the excavated earth is easily removed a fire trench without parapet may be the one best suited to the soil and other conditions affecting the choice of profile. (Fig. 4.) The enemy's infantry, as well as his artillery, will generally have great difficulty in seeing this type of trench.

The top of the trench should be covered with sod, grass or leaves to hide the newly turned earth, which will easily be seen and form a good aiming point for the enemy unless covered. There should be no rocks, loose stones, or pebbles on top, which might be struck by the bullets, splintering and flying, thus adding greatly to the number of dangerous projectiles, and often deflecting bullets downward into the trench. A stone wall is a very dangerous thing to be behind in a fight.

Figure 5 shows a section of a company trench with traverses. These should be 6 or 8 feet wide.

1047. Head Cover: Head cover is the term applied to any horizontal cover which may be provided above the plane of fire for the protection of the men when firing over the parapet. It is ob-

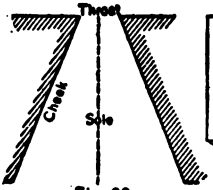
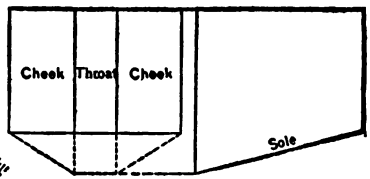


Fig. 22



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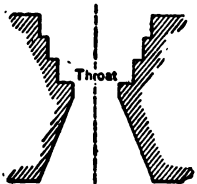

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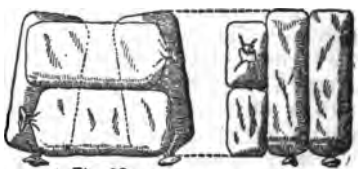

Fig. 25

Fig. 26.

Fig. 27

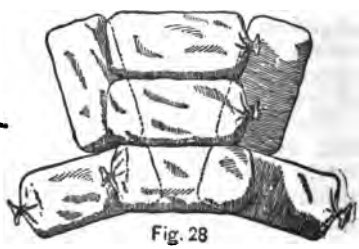

Fig. 28

Fig. 29

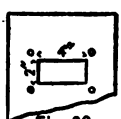

Fig. 30

Fig. 31

Fig. 32

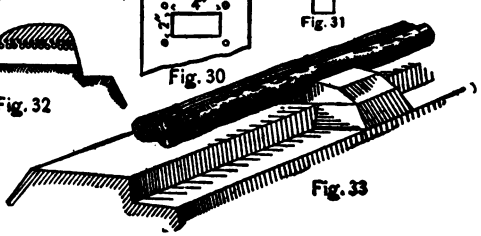

Fig. 33

tained by notching or loopholing the top of the parapet. Head cover is of limited value. It can rarely be used to advantage in the fire trenches except for long-range firing. At short range loopholes and notches disclose the position of the parapet and serve as aiming points for the enemy. They are of more use, however, in the cover trenches where facilities for concealment are better.

Figures 22 to 33 show various forms of notches and loopholes and suggest the methods of constructing them on the parapet. The construction of a notch requires only the introduction of some rigid material to form the sides; by adding cover the notch becomes a loophole. A serviceable form of loophole consists of a pyramidal box of plank with a steel plate spiked across the small end and pierced for fire. Figure 29 shows a section of such a construction. It is commonly known as the **hopper loophole.** The plate should be ⅜ in. thick if of special steel; or ½ in., if ordinary metal. Figure 30 shows the opening used by the Japanese in Manchuria and Figure 31 that used by the Russians.

Filled sandbags kept in the trench when the men are not firing may be thrown on the parapet to form notches or loopholes when the troops in the trench open fire and concealment of the trench is no longer necessary or possible. Steel shields with small firing holes cut in them may be used in the same manner.

1048. Figure 6 shows a schematic plan of a line of fire trenches for two battalions with the necessary cover and communicating trenches in rear.

Cover trenches are placed as closely as practicable to their respective fire trenches. When natural cover is not available, each fire trench should have artificial cover in rear for its support

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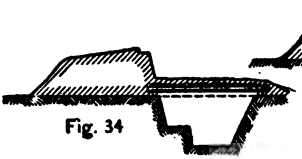

Fig. 34

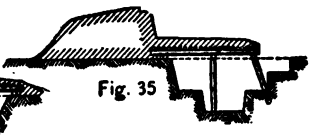

Fig. 35

Fig. 36

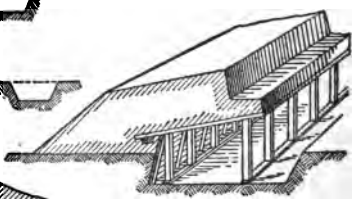

Fig. 37

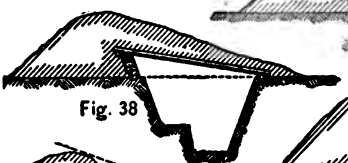

Fig. 38

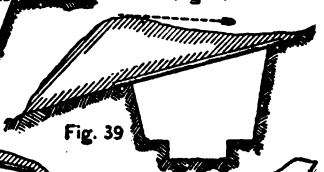

Fig. 39

Fig. 40

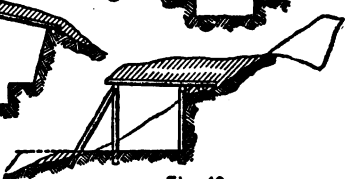

Fig. 42

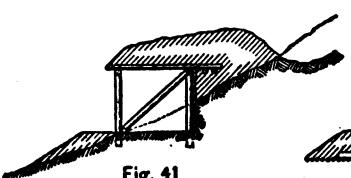

Fig. 41

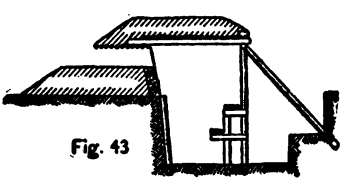

Fig. 43

—either a cover trench of its own or one in common with an adjoining fire trench.

The cover trench is simple and rectangular in profile. Concealment is indispensable. It is generally concealed by the contour of the ground or by natural features, but to guard against hostile searching fire overhead cover is frequently advisable.

Cover trenches should be made as comfortable as possible. It will often be advisable to make them extensive enough to provide cooking and resting facilities for the garrisons of the corresponding fire trenches.

1049. Overhead cover: Figures 34 to 43 show various forms of overhead cover suitable for use as cover or shelter trenches under various conditions. For winter they should be closed in and means provided for heating.

Overhead cover usually consists of a raised platform of some kind covered with earth. It is frequently combined with horizontal cover in a single structure, which protects the top and exposed side. The supporting platforms will almost always be of wood and may vary from brushwood or light poles to heavy timbers and planks. It is better, especially with brush or poles, to place a layer of sods, grass down, or grain sacks over the platform before putting on the earth, to prevent the latter from sifting through.

The thickness of overhead cover depends upon the class of fire against which protection is desired, and is sometimes limited by the vertical space available, since it must afford headroom beneath, and generally should not project above the nearest natural or artificial horizontal cover. For splinter proofs a layer of earth 6 to 8 ins. thick on a support of brush or poles strong enough to hold it up will suffice if the structure is horizontal. If the front is higher than the rear, less thickness is

necessary; if the rear is higher than the front, more is required. For bombproofs a minimum thickness of 6 ins. of timber and 3 ft. of earth is necessary against field and siege guns, or 12 ins. timber and 6 ft. of earth against the howitzers and mortars of a heavy siege train.

In determining the **area of overhead cover** to be provided, allow 6 sq. ft. per man for occupancy while on duty only, or 12 sq. ft. per man for continuous occupancy not of long duration. For long occupation 18 to 20 sq. ft. per man should be provided.

1050. Communicating trenches are frequently necessary in order to connect fire trenches with their corresponding cover trenches where natural, covered communication is impracticable. They are generally rectangular in profile, deep and narrow. They are traversed or zigzagged to escape enfilade.

Returns or pockets should be provided for use as latrines, storerooms, dressing stations, passing points for troops, etc.

Cover from observation while passing through the trench may insure against loss as effectively as material cover from the enemy's fire.

1051. Communicating ways, naturally or artificially screened from the enemy's view, provide sufficient cover for the passage of troops.

1052. Dummy trenches draw the enemy's attention and fire and thus protect the true fire trench.

Any type is suitable which presents to the enemy the appearance of a true trench imperfectly concealed.

1053. When it is uncertain whether time will permit the completion of all the work planned, work should proceed with due regard to the order of importance of the several operations. Ordinarily the order of importance will be:

1. Clearing foreground to improve the field of fire and construction of fire trench.
2. Head or overhead cover; concealment.
3. Placing obstacles and recording ranges.
4. Cover trenches for supports and local reserves.
5. Communicating trenches.
6. Widening and deepening of trenches; interior conveniences.

1054. When troops are likely to remain in trenches for a considerable time drainage should be arranged for, and latrines and dressing stations should be constructed in trenches. Water should be brought into the trenches and holes excavated in the front wall of the trench for extra ammunition.

1055. In digging trenches men usually work in reliefs, one relief working while the others rest, the proportion of shovelers to pick being about 3 to 1. If a plow can be obtained to turn the sod, it will greatly facilitate the initial work of digging.

1056. Average Results of One Man Hour Labor:

Excavation—	
In easy soil—	Cubic feet[1]
First hour	30
Second hour	25
Third hour	15
Thereafter continuous work	10
In hard soil, about half the above.	
In loose earth, 60 cubic feet.	
Filling sandbags, 20 bags (0.5 cubic foot each).	
Revetment construction (material and tools on hand):	
Rough brushwood or plank..sq. ft. per man hour	40
Brushwood hurdles, rough—	
Making " " "	15
Placing " " "	30

[1] By working two reliefs above figures can be increased by one-third.

Revetment construction—*Continued.*

Sandbags—				
Filling	sq. ft.	per	man hour	10
Placing	"	"	"	20
Sod—				
Obtaining sod for	"	"	"	7
Placing	"	"	"	10

Obstacle construction (material and tools on hand)—

Abatis, wired (1 strong row)	linear feet	1.3

With entanglement—

High	sq. feet	27
Low	sq. feet	90

Clearing[1]—

Thickets up to 1.5 inches diameter	sq. yards	25
Light clearings of soft woods, trees to 12 inches in diameter	sq. yards	25
Medium clearing	sq. yards	15

1057. Penetration of Rifle Bullet:

Material	Inches 200 yards	600 yards
Commercial steel	0.30	0.20
1 inch broken stone gravel	4.80	4.28
Hard coal between 1-inch boards	9.00	7.00
Brick masonry, cement[1]	2.20	1.16
Brick masonry, lime[1]	2.40	1.14
Sand, dry[2]	18.18	11.96
Concrete, Port. 1-3-5	3.00	1.86
Oak	26.46	12.46
Sand, wet	30.00	13.00
Pine	25.72	13.00
Earth, loam	30.00	16.12
Greasy clay	60.00	32.00

[1] For single shot. [2] In sacks, about one-half these figures.

1058. Effect of Artillery Fire:

Up to 3,000 yards, the 3-inch field gun, using high-explosive shell, is effective against ordinary types of overhead cover for field trenches, brick buildings, and stone walls 2 feet thick. It is ineffective against earthen parapets.

[1] Removal of cuttings in both cases involves an equal amount of labor.

Fig. 90

Fig. 91

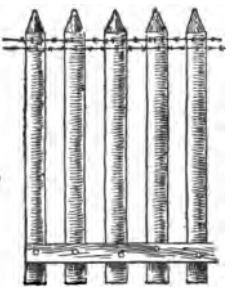

Fig. 92

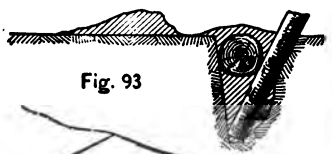

Fig. 93

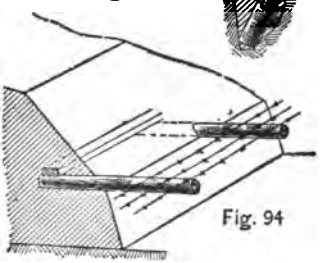

Fig. 94

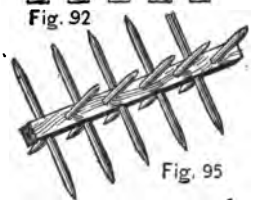

Fig. 95

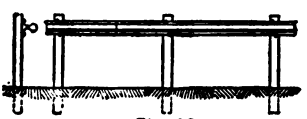

Fig. 98

Fig. 97

Fig. 96

Fig. 99

Fig. 100

The heavier types of field guns and howitzers are effective against all kinds of field works, and protection against this kind of fire must be secured by concealment or deep dugouts with several exits.

Obstacles

1059. Obstacles are designed to protect the works from surprise and to reduce the momentum of attack by breaking up the enemy's formation and holding him under the accurate fire of the defense. They should be **invisible** from the direction of approach, should be **difficult to destroy,** and should afford **no screen or cover** to the enemy.

Obstacles should be placed close to the fire trenches so that they may be protected, especially at night. The distance varies between 15 to 80 yards. They should be low and so constructed that men cannot crawl under them. The lower they are the safer they will be from the fire of the defender as well as from the artillery fire of the enemy. Gaps closed by portable obstacles should be provided to permit of the counterattack.

Abatis consists of trees lying parallel to each other with the branches pointing in the general direction of approach and interlaced. All leaves and small twigs should be removed and the stiff ends of branches pointed.

Barbed wire may be interlaced among the branches. Successive rows are placed, the branches of one extending over the trunks of the one in front, so as to make the abatis 5 ft. high and as wide as desired. It is better to place the abatis in a natural depression or a ditch, for concealment and protection from fire. Figure 90 shows a typical form of abatis. An abatis formed by felling trees toward the enemy, leaving the butt hanging to the stump, the branches prepared as before, is called a **slashing** (Fig. 91). It gives too much cover and should be well flanked.

A palisade is a man-tight fence of posts. Round poles 4 to 6 ins. in diam. at the large end are best. The top should be pointed. A strand or two of barbed wire run along the top and stapled to each post is a valuable addition.

Palisading is best made up in panels of 6 or 8 ft. length, connected by a waling piece, preferably of plank, otherwise of split stuff. If the tops are free, two wales should be used, both underground. If the tops are connected by wires, one will do.

Palisades should be planted to incline slightly to the front. Figures 92 and 93 show the construction and placing of palisades.

A fraise is a palisade horizontal, or nearly so, projecting from the scarp or counterscarp. A modern and better form consists of supports at 3 or 4 ft. intervals, connected by barbed wire, forming a horizontal wire fence (Fig. 94).

Cheveaux de frise are obstacles of the form shown in Figure 95. They are usually made in sections of manageable length chained together at the ends. They are most useful in closing roads or other narrow passages, as they can be quickly opened for friendly troops. Figures 96 and 97 show methods of constructing cheveaux de frise with dimension stuff.

A formidable obstacle against cavalry and automobiles consists of railroad ties planted at intervals of 10 ft. with the tops 4½ ft. above the ground, and connected by a line of rails spiked securely to each (Fig. 98). The rail ends should be connected by fish plates and bolted, with the ends of the bolts riveted down on the ends.

Figures 99 and 100 show forms of heavy obstacles employed in Manchuria by the Russians and Japanese, respectively. The former is composed of timber trestles, made in rear and carried out at night. The latter appears to have been planted in place.

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A wire entanglement is composed of stakes driven in the ground and connected by wire, barbed is the best, passing horizontally or diagonally, or both. The stakes are roughly in rectangular or quincunx order, but slight irregularities both of position and height should be introduced.

In the **high entanglement** the stakes average 4

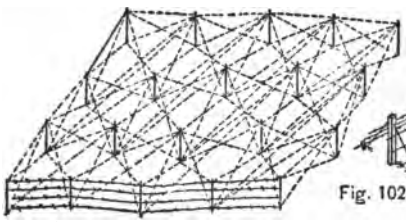

Fig. 101

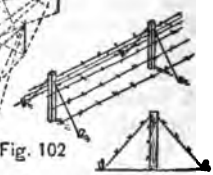

Fig. 102

Fig. 103

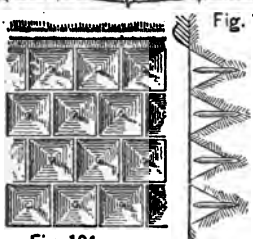

Fig. 104

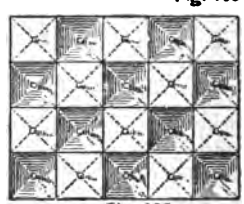

Fig. 105

ft. from the ground, and the wiring is horizontal and diagonal (Fig. 101).

The lower wire entanglement has stakes averaging 18 ins. above the ground and the wire is horizontal only. This form is especially effective if concealed in high grass. In both kinds the wires should be wound around the stakes and stapled and passed loosely from one stake to the next. When two or more wires cross they should be tied together. Barbed wire is more difficult to string but better when done. The most practicable form

results from the use of barbed wire for the horizontal strands and smooth wire for the rest.

This is the most generally useful of all obstacles because of the rapidity of construction, the difficulty of removal, the comparatively slight injury from artillery fire, and its independence of local material supplies.

1060. Barbed-wire entanglements are the most common and important of the obstacles used in the present war. The entanglements are made in many forms and used in various ways. They are usually made and repaired at night or when the enemy is working on his entanglements. The depths of entanglements depend upon the strength of the position. To be effective the depth should not be less than 10 yards. In some places it runs as high as 60 and 70. The length of wire used runs from 100 to 900 miles per mile of front. Where several lines of fire trenches are used, each fire trench has its own protecting entanglement. The ground underneath the wire should be strewn with broken glass, bottles, nails driven up through boards, and other articles that will injure men crawling on the ground. For concealment, the posts should be painted green or other color to match the ground. Trip wires and alarm wires are stretched in front to give warning by means of various signals, of the approach of the enemy toward the entanglements.

Barbed wire should always be used in connection with other obstacles, where possible, in view of the greater resulting effect. Figures 90 to 105 show the common forms of obstacles in connection with each of which, barbed wire should be used. In practice the construction is more irregular. Other forms of obstacles easily made, and other ways of using wire as an obstacle will usually suggest themselves on the spot. Wire entanglements should always be made loosely as they will be

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harder to cut than if taut. In emergencies, good results will be obtained by unreeling the wire in loose spirals along the ground in front of hasty intrenchments. When so used the ends should be staked down as securely as possible.

Time and materials: One man can make 10 sq. yds. of low and 3 sq. yds. of high entanglement per hour. The low form requires 10 ft. of wire per sq. yd. and the high 30 ft. No. 14 is a suitable size. The smooth wire runs 58.9 ft. to the lb. A 100-lb. coil will make 600 sq. yds. of low or 200 sq. yds. of high entanglement. If barbed wire is used, the weight will be about 2½ times as much.

Wire fence: An ordinary barbed-wire fence is a considerable obstacle if well swept by fire. It becomes more formidable if a ditch is dug on one or both sides to obstruct the passage of wheels after the fence has been cut. The fence is much more difficult to get through if provided with an apron on one or both sides, inclined at an angle of about 45°, as indicated in Figures 102 and 103. This form was much used in South Africa for connecting lines between blockhouses.

1061. Military pits or **trous de loup** are excavations in the shape of an inverted cone or pyramid, with a pointed stake in the bottom. They should not be so deep as to afford cover to the skirmisher. Two and one-half feet or less is a suitable depth. Fig. 104 shows a plan and section of such pits.

An excellent arrangement is to dig the pits in a checkerboard plan, leaving alternate squares and placing a stake in each of them to form a wire entanglement (Fig. 105). One man can make 5 pits on a 2-hour relief.

1062. Miscellaneous barricades: Anything rigid in form and movable may be used to give cover from view and fire and to obstruct the advance of an assailant. Boxes, bales and sacks of goods, furniture, books, etc., have been so used.

The principles above stated for other obstacles should be followed, so far as the character of the materials will permit. The rest ingenuity must supply. Such devices are usually called **barricades** and are useful in blocking the streets of towns and cities.

Demolitions

1063. Military demolitions have for their purpose to destroy or make unserviceable any objects in the theater of war the preservation of which would be unfavorable to the army or favorable to the enemy, excepting always objects neutralized by international convention or the laws of war.

Methods employed: Demolitions may be made by **fire**, by **mechanical means**, or by **explosives.** Fire is the only recourse when absolute destruction is necessary, as in case of food supplies, munitions of war, structural materials, etc. Soluble matter, as gunpowder, sugar, salt, etc., might be destroyed in water, but this method is laborious. Burning is equally effective and much easier.

Demolition by mechanical means is too simple to require, and too varied to permit, detailed description. Reference is made to a few cases in which the best method may not be obvious.

Abatis is difficult to destroy. If the trees are dry, time suffices, and concealment is not essential, fire is best; otherwise, if working from the front, cut up and carry away enough trees to make a passage through. If working from the rear, loosen the fastenings of the butts and haul away bodily with ropes.

Wire entanglements must be cut with nippers, the more and shorter the pieces the better. Wire may be cut with an axe or machete if a block of wood is held behind it as an anvil. **Trous de loup** are leveled by shoveling the walls into the pits, or bridged with planks, fascines, or other materials.

Railroads: Operations may be directed against rolling stock, bridges, culverts, tunnels or track, or accessories, such as water stations, telegraphs.

Locomotives are temporarily disabled by removing valves or other small vital parts; permanently, by building a fire in a dry boiler or by detonating a charge of explosive in the boiler.

Wooden bridges may be burned or small ones may be pried off their seats by levers or dragged off with tackle.

Track may be destroyed by taking it up, burning the ties, heating the rails on the fires and twisting them with bars through the bolt holes, with a chain and lever, or a hook and lever.

Telegraph lines are temporarily disabled by **breaks,** in which the wires are cut, **grounds,** in which the wires are connected to the ground, and **crosses,** in which a metallic connection is made between the wires.

To destroy a telegraph line cut down and burn poles, cut and tangle wires, and break insulators.

1064. Demolition with explosives: Handling, priming, and firing explosives for demolition purposes are done as described below. Bickford fuze will be generally used in such work. Simultaneous ignition at long distances from the firing point should not be attempted unless a battery and electric fuzes are available. In such cases the charges should be so arranged that the plan will not fail even though all charges do not go off at once. Proper charges and the best way to place them will be indicated for the most frequent and important uses.

1065. Explosive: A satisfactory explosive for the purposes of military engineering must be:

(1) Stable as to its constitution and characteristics for a long period.

(2) Unaffected by ordinary variations of temperature and moisture.

(3) Insensitive to shocks of handling, transportation, projectiles, and neighboring explosions.

(4) Not too difficult of detonation.

(5) Quick enough to give good results when not confined and slow enough to give good results when confined.

(6) Convenient in form and consistency for packing and loading and for making up charges of different weights.

The third and fourth of the above requirements are antagonistic and must be compromised.

These conditions point to a high explosive of medium strength, of granular or plastic consistency, put up in waterproof cylindrical cartridges of standard size and length. A number of explosives meeting these requirements fairly well are on the market. No one of them is so distinctly superior as to warrant its adoption to the exclusion of the rest, and the one most easily procured at the time and place of need will probably be used.

Among them are the dynamites, gelatins, picric powders, Jovite, gun cotton, "Explosive D," Trotol, and ammonol.

Care and handling of high explosives: Such powders as have been described as suitable for use in military engineering operations are, when in sound condition, less liable to accidental explosion than gunpowder. It is the more disastrous result of a premature explosion, rather than the greater probability of its occurrence, that has caused high explosives to be regarded as especially dangerous. The following precautions should always be taken:

Gun cotton should be kept **saturated** with 30 per cent of its weight of water. If not hermetically sealed, the packages should be examined once a month or oftener and resaturated. The cotton required for **primers** must be **stored dry** and kept free from moisture. The cakes may be dipped in melted paraffin. The dry cotton must be **kept well**

apart from any other explosives and from caps. If dry primers are not at hand, **wet cakes** must be dried at a temperature not exceeding 120° F.

All other powders should be stored in a cool, dry, shaded, and well ventilated space. The main supply must be well removed from the working points.

Avoid any unnecessary accumulation of powder at any other place than the magazine provided for it, and especially do not allow any powder to be stored near where caps are stored or where primers are made up.

Keep fire away from the powder and the **powder away from the fire.**

Do not use hard-metal tools in manipulating cartridges. Copper is the only metal that should be used. **Wood is better.**

Keep cartridges free from sand or other gritty substance.

Do not bend, strike, or **heat** a **cap** or **primer.** See that the **paraffin coating** of every cap is **free** from **cracks** or **holes.** The copper must be completely protected from contact with powder. **Redip if necessary,** keeping the paraffin in a water bath and only warm enough to flow freely.

Be careful not to allow a **pull** to come on the wire or fuzes attached to a cap.

The exploder should not be connected to the leads, nor a **fuze lighted** until everything is ready for firing, warning has been given, and time allowed for everyone to get to a safe distance. As a rule, the exploder should be used or the fuze lighted under the personal supervision of the responsible officer.

1066. Firing devices: The powders which will be used are all of the class which can be fired by **detonation** only. The detonating compound in general use is **fulminate** of **mercury** and all methods of firing involve the explosion of a small

Fig. 168

Fig. 169

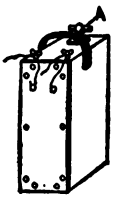

Fig. 170

Fig. 171

Fig. 172

Fig. 174

Fig. 176

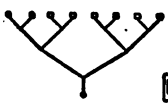

Fig. 173

Fig. 175

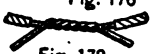

Fig. 178

Fig. 177

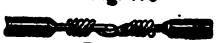

Fig. 179

Fig. 180

Fig. 181

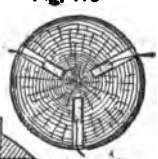

Fig. 182

Fig. 183

Fig. 184

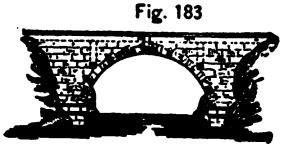

Fig. 185

Fig. 186

quantity of fulminate inclosed in a cap or fuse and placed in the charge. **The fulminate** is easily ignited and very violent, which qualities have determined its use. It is unstable, corrosive, spoiled by moisture, and highly sensitive to shock and friction. Except strength, it possesses no characteristic which does not tend to unfit it for military purposes. It is used as a matter of necessity.

Caps and fuzes must be **carefully handled,** must not be assembled in considerable quantities, and must be kept away from the explosive.

1067. **For firing by electricity a magneto-electric** machine is used, the one most commonly employed being a **Laflin & Rand Exploder,** No. 3. Its exterior appearance is shown in fig. 170. The handle **A** is raised to its full height and depressed as forcibly as can be done with the hand.

Caps or detonators are of two forms, adapted for firing with **powder fuze,** fig. 171, or by **electricity,** fig. 172. In both forms the fulminate, usually mixed in proportion of 10 parts to 1 by weight with nitrate or chlorate of potassium to reduce its corrosive action, is contained in a copper capsule.

Caps and fuzes are usually **rated** as follows:

	Weight of charge in grams.	Weight of charge in grains.
No. 3 or 3 X.....	0.54	8.33
No. 4 or 4 X.....	0.65	10.03
No. 5 or 5 X.....	0.80	12.34
No. 6 or 6 X.....	1.00	15.43
No. 7 or 7 X.....	1.50	23.15
No. 8 or 8 X.....	2.00	30.86

The strength of the cap makes a difference in the force of the explosion. This is greater for low-grade powders. For 40% dynamite, explosion by a 5 X cap is 15% stronger than by a 3 X. For 60% dynamite, the difference is only 6%. The

same result follows from a loss of strength in the same cap. A 5 X cap may by deterioration become of the same strength as a 3 X and will then produce an explosion so much the less effective. It is **very important** to prevent deterioration of caps and also to know whether they have deteriorated or not. Caps stored in a damp place deteriorate rapidly. With less than 0.25% of moisture the caps will not explode dynamite, though they may still explode themselves. To secure the maximum effect from high explosives nothing less than a No. 6 cap or fuze should be used.

Caps may be tested by exploding them in a confined space and noting the report and the effect on the shell. A cap in full strength will tear the copper shell into minute pieces, while a deteriorated cap will tear larger pieces.

1068. Simultaneous ignitions: When a total blast is divided into a number of charges, it is important that all should go at the same instant. This will not be easy with the time fuze, and that method will not be used unless absolutely necessary. If it is used, certain precautions must be observed to avoid total failure. The fuze must be so laid that the total length from the firing point to each charge will be the same. It will be better to use time fuze to a common point near the charge, and instantaneous fuze from there on. Figs. 173 and 174 show typical arrangements.

In simultaneous ignitions by electricity, the fuzes are connected in **series**; that is to say, they are all placed in the same circuit, fig. 175.

Figs. 178 and 179 show methods of jointing wires; the former, for temporary use, as a lead to a fuze wire; the latter, for more permanent use. The ends of the wires must always be brightened by scraping with a knife or otherwise. To insulate, wrap with rubber tape, lapping well on to the covering in both directions.

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1069. Priming: The cap is inserted in a cartridge, usually called a **primer.** Whenever reference is made herein to use of explosives in or near water it is to be understood that under all circumstances the **cap and primer must be kept perfectly dry.** If but one primer is used, it should be placed near the center of the charge when the size and shape of the charge permit it to go in that position. If the cartridges are placed in a drill hole, as in rock blasting and some demolitions, the primer is put in last with the cap end down. The cap may be inserted as shown (Figs. 176 and 177). Figure 176 applies to caps fired by **train fuze** and **no other method** may be used with such caps. **The projection** of about ⅛ to ¼ inch of the cap case above the surface of the powder is **to prevent** the latter from **taking fire** from the sparks of the fuze and burning partially before the fuze goes, which, should it occur, will reduce the force of the explosion, or may cause complete failure.

Primers must be prepared at a safe distance from the charge and from the store of caps and should be placed as short a time as possible before firing.

1070. Misfires: In case of a misfire there is risk in approaching the holes for several minutes, if electric firing is used, and for several hours in case of firing by fuze. Rules to this effect are laid down where safety to human life is a paramount consideration.

1071. Loading: The charge should fill the chamber as nearly as practicable. If drill holes are used, they should be just large enough to permit a cartridge to slip down without jamming. In quarrying, cartridges are frequently slit open before they are placed in the hole, so that with a slight pressure of the tamping rod, they spread and fill the hole completely.

The charging should be **personally directed** by

the responsible officer, and if but one person can get at the charge at a time, he should place the powder himself. Such illumination as may be necessary must be provided by closed lights, with effective precautions against fire. When the primer is placed in the middle of a bulky charge, the wires or fuze must be led out through the powder. Only instantaneous fuze can be so used. If time fuze must be used, place the primer in the middle of one side of the charge so arranged that it must go before any sparks from the fuze can set fire to the powder.

When electric firing is used, the wires of each fuze should be twisted together at the ends to prevent the possibility of a chance current going through the fuze and for identification for connecting to each other and to the leads. Care must be taken that at no stage of the loading or tamping is a strain brought on any fuze or fuze wires, or any injury done to their coverings.

1072. **Tamping** is less important for high explosives than for gunpowder, since the former do a fair proportion of their work without tamping, while the latter does practically none. Light tamping is desirable, however, and may consist of the excavated earth replaced in the communication next to the chamber to a distance of 6 to 10 ft. The use of high explosives facilitates tamping, because so many charges can be placed in drill holes, which are easily tamped.

For drill holes in rock which will hold it, water is the best possible tamping, otherwise sand or stone dust may be used. If the hole points upward, the top should be covered with a board or thick brush to stop the tamping which is blown out like a projectile. If neighboring ground cannot be cleared for firing, the entire surface of the probable crater should be masked by brush or timbers piled upon it, and weighted down if necessary.

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1073. The quantity of the standard explosive (50 per cent dynamite) and the equivalents of other explosives necessary for demolitions, and the methods of placing explosive charges for the destruction of standard structures are given in publications issued to all officers charged with this duty.

Military Bridges

INTRODUCTION

1074. Bridge construction in the present war has become more important than heretofore, not only because of the greater demands and far-reaching results obtained, but also on account of the greater loads to be carried in the form of motor vehicles and larger guns.

1075. The **kind** of **bridge** to be built depends upon the **load,** the nature of the **obstacle,** and the **materials** available. Time is of prime importance in the construction of bridges for troops in campaign, and the proper distribution of men and material to do the work quickly must be made.

1076. Loads.—Loads are classified as **dead** or stationary and **live** or moving. Generally speaking, the former is the weight of the bridge itself and the latter the weight of the traffic over it. Loads are usually stated in lbs. per sq. ft. for highway and per lin. ft. for military and railway bridges. Some loads of military bridges are as follows, all in lbs. per lin. ft.: Infantry, single file, 140; infantry, column of twos, 280; infantry, column of fours, 560; cavalry, in single file, 196; cavalry in column of twos, 392. Infantry in heavy marching order average 200 lbs. per man; when unarmed, 160 lbs. When crowded in a mass they may weigh 133 lbs. per sq. ft. of standing room.

1077. Bridges for general road traffic.—The **dead load** is the weight of the superstructure.

Estimate quantities of the different materials and multiply by unit weights from the following:

The **live load** is **assumed** at 100 lbs. per sq. ft. of floor, or 5 tons concentrated on two axles 5 ft. long and 8 ft. c. to c.

Bridges for a special purpose exclusively may be proportioned for the corresponding load.

1078. Railroad bridges.—The **dead load** is computed as before. To save time the floor, consisting of rails, ties, and guard timbers only, may be taken at 400 lbs. per lin. ft. of **track.**

The **live load** on **each** track, supposed to be moving in either direction, may be assumed at 6,000 lbs. per lin. ft. of track, or 50,000 lbs. on each of two pairs of driving wheels 7½ ft. c. to c.

1079. Site.—Favorable conditions are narrowness of stream; stable banks of equal height; hard but penetrable bottom; moderate depth and current; permanent water level, and absence of navigation.

GENERAL NOTES ON BRIDGE DESIGN

1080. When frequent supports can be obtained, the floor system, consisting of longitudinal beams and cross planking, or their equivalents, rests directly on piers. This method of construction should be adopted whenever practicable. If long spans are necessary, the floor system must be sustained by **cantilevers, trusses, arches,** or **cables** resting on the supports and forming cantilever, truss, arched, or suspension bridges.

1081. A roadway 9 ft. wide in the clear should be provided to pass infantry in fours, cavalry two abreast, and military wagons in one direction; a width of 6 ft. will suffice for infantry in column of twos, cavalry in single file, and field guns passed over by hand.

The **clear width** of roadway of an ordinary high-

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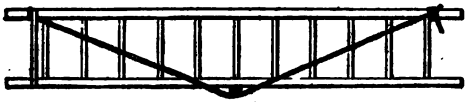

Fig. 100.

Fig. 99.

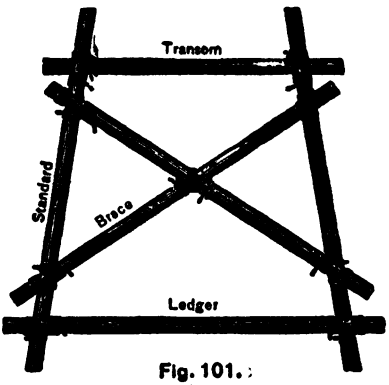

Fig. 101.

Fig. 103.

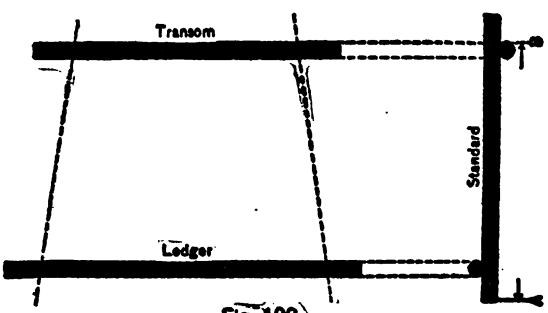

Fig. 102.

way bridge should not be less than 12 ft. for single track, or 20 ft. for double track.

The **clear head room** in ordinary military bridges should not be less than 9 ft. for wagons and cavalry; for highway bridges not less than 14 ft.

Ramps at the ends of a bridge, if intended for artillery, should not be steeper than 1 on 7. For animals, slopes steeper than 1 on 10 are inconvenient.

1082. Examples of **improvised short-span military bridges:**

Trussed ladder bridge.—A ladder may be used as a bridge by placing it on its edge, thus forming a kind of trussed beam.

The ladder beam may be greatly strengthened by trussing with a rope, as may be seen in Figure 100.

In shallow streams intermediate supports may be quickly obtained by moving wagons into the water.

1083. Spar bridges.—This name is applied to bridges built of round timbers lashed together. Intermediate points of support are provided by inclined frames acting as struts to transmit weight from the middle of the bridge to the banks. The single-lock and double-lock bridges with two and three spans of 15 ft., respectively, are the ones of most utility.

The first step in constructing a spar bridge is to measure the gap to be bridged and select the position of the footings on either bank. Determine the distance from each footing to the middle point of the roadway if a single-lock, or the two corresponding points of a double-lock bridge. Next determine and mark on each spar except the diagonals the places where other spars cross it. The marking may be done with chalk, or with an ax. If possible a convenient notation should be adopted. As, for example, in marking with

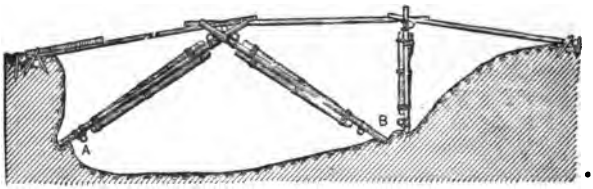

Fig. 104

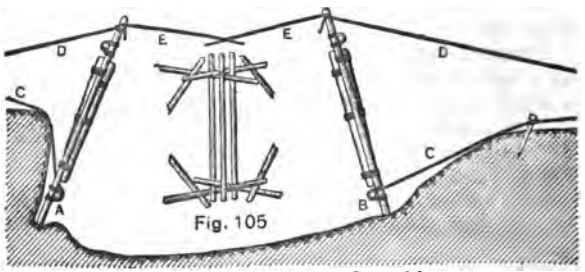

Fig. 105

Fig. 106

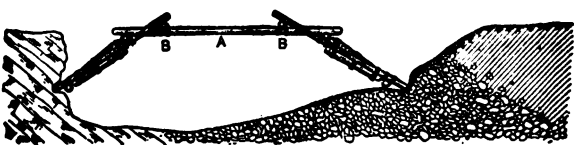

Fig. 107

Fig. 108

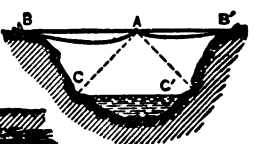

Fig. 109

Fig. 110

chalk, a ring around the spar where the edge of the crossing spar will come, and a diagonal cross on the part which will be hidden by the crossing spar.

A simple way to determine the length of spars is the following: Take two small lines somewhat longer than the width of the gap, double each and lash the bights together. Stretch them tightly across the gap so that the lashing comes at the middle, as at **A**, fig. 109. Release one end of each and stretch it to the footing on the same side as indicated by the dotted lines. Mark each line at the footing **C** or **C'**, and at the position chosen for the abutment sill, **B** or **B'**. Cut the lashing and take each piece of rope to its own side. The distances **AB** and **AB'** are the lengths between the transoms, and with 2 ft. added give the length of road bearers required. The distances **AC** and **AC'** are the length of struts from butt to top of transom, and with 3 ft. added, give the total length of spars required.

For a double-lock bridge, a piece of rope of a length equal to the length of the middle bay replaces the lashing. If the banks are not parallel, a measurement should be taken on each side of the bridge.

The construction of a frame is shown in Figure 101, and the system of marking in Figure 102. The arrangement of frames to form a single-lock bridge is shown in Figures 104 and 105, and a double-lock bridge in Figure 107.

1084. Construction of single-lock bridges (Figs. 104, 105, and 106)—Suitable for spans of 30 ft. or less. The two frames lock together at the center of the span; their slope must not be more than 4 on 7. The bridge can be erected by two or three noncommissioned officers and 20 men, one-half on each side of the gap. Heavy spars require more men.

The footings at **A** and **B** must be firm, horizontal if possible, and at right angles to the axis of the bridge. In a masonry pier they may be cut out. In firm soil a simple trench will suffice. In yielding soil a plank or sill must be laid in the trench. The frames are made of such length as to give a slight camber to the bridge which may be increased to allow for probable settlement of the footings. The inside dimension of one frame is made slightly greater than the outside dimension of the other, so that one frame may fall inside of the other when hauled into position. For a 9 ft. roadway the standards of the narrow (inside) frame should be 9 ft. 6 ins. apart at the transom and 10 ft. 6 ins. at the ledger, in the clear, and the other (outside) frame 1 ft. 6 ins. wider throughout.

A frame is constructed on each bank. The standards are laid on the ground in prolongation of the bridge, butts toward the bank. The ledgers are lashed on **above** and the transoms **beneath** the standard at the positions marked. The diagonal braces are lashed to the standards, two butts and one tip above the latter, and to each other. Before the braces are lashed the frame must be squared by checking the measurements of the diagonals.

If necessary, pickets for the foot and guy ropes are driven, the former about 2 paces from the bank and 4 paces on each side of the axis of the bridge; the latter about 20 paces from the bank and 10 paces on each side of the axis. The foot ropes, **CC** (Fig. 106) are secured by timber hitches to the butts of the standards and the back and fore guys, **DD**, and **EE**, to the tips; the fore guys are passed across to the opposite bank. The guys of the narrow frame should be **inside** the guys and standards of the wide frame.

The frames are put into position one after the other, or simultaneously if there are enough men. A man is told off to each foot rope and one to

each back guy to slack off as required, two turns being taken with each of these ropes around their respective pickets. The other men raise the frame and launch it forward, assisted by the men at the fore guys, until the frame is balanced on the edge of the bank. The frame is then tilted until the butts rest on the footing by slacking off the foot ropes and hauling on the fore guys (Fig. 106). After the head of the frame has been hauled over beyond the perpendicular, it is lowered nearly into its final position by slacking off the back guys. When the two frames are in this position opposite each other, the narrow frame is further lowered until its standards rest upon the transom of the other. The wider (outer) frame is then lowered until the two lock into each other, the standards of each resting upon the transom of the other.

The center of fork transom (Figs. 104 and 105) is then passed from shore and placed in the fork between the two frames. This forms the central support to receive a floor system of two bays, built as already described.

The estimated time for construction of such a bridge is about one hour if the material is available and in position on both sides of the stream. The construction of the roadway requires about twenty minutes; forming footings in masonry about one hour.

1085. Construction of double-lock bridge (Fig. 107).—Suitable for spans not exceeding 45 ft., and consisting of two inclined frames which lock into a connecting horizontal frame of two or more distance pieces, with cross transoms, dividing the gap to be bridged into three equal bays of about 15 ft. The force required is two or three non-commissioned officers and 25 to 50 men; the time for construction, except roadway, about two and one-half hours; extra time to be allowed for difficult footings.

The width of gap is measured, the position of footings is determined, and the length of standards from butt to transom determined and marked as before.

The inclined frames in this case are built of equal widths, launched as before, and held by guys just above their final position. Two stringers are launched out from each bank to the main transom. The distance pieces (Fig. 107), are put into position inside the standards, using tackle if necessary, and the road transoms are placed and lashed to the distance pieces at the places marked. Both frames are now lowered until they jam.

FLOATING BRIDGES

1086. Bridges of this class have several disadvantages, due to change in grade of roadway with change of water level and with change of load, and to their limited capacity, which can not exceed the flotation of the supports. As a rule, such bridges will be resorted to only when the materials for them are plentiful and the materials for other kinds scarce.

This rule finds an important exception in the organized bridge equipage prepared in advance to be carried with an army. Such a bridge possesses a great advantage in the paramount element of time, since it can be laid, crossed, and taken up in less time than any other form of bridge can be built, and its component parts can be used as water transportation for several important purposes which no other kind of bridge can subserve.

1087. The bridge equipage adopted for the United States service is of two forms, **heavy** and **light.**

The heavy equipage is sufficient in capacity for all requirements of an army on the march, and is mobile enough to be carried at the ordinary rate of marching. In the light equipage, capacity

is somewhat sacrificed for the sake of further mobility to enable a bridge to be carried with a rapidly moving column.

The principal parts in both forms of bridge are **pontoons** or boats; the longitudinal bearers or stringers joining them called **balks**; the cross planks, called **chess**, and the beams which hold the chess in position, called **side rails** (Fig. 181).

1088. In the heavy train each division will construct a bridge of 11 bays, or 225 ft. in length, and is divided into four **sections**, two of which are called **pontoon sections** and the other two **abutment sections.** The abutment or end sections suffice for any length of bridge. Increase in length is accomplished by adding one or more pontoon or interior sections. The pontoon section is never divided, as it can not be done without breaking wagon loads. This equipage weighs, wagons included, 315 lbs. per ft. of bridge, or without wagons 169 lbs.

A division of light equipage will construct 186 ft. of bridge. It is not divided into sections, as each pontoon wagon carries the material for a complete bay and the bridge may be lengthened by adding one or more pontoon wagons. This equipage weighs, including wagons, 275 lbs. per ft. of bridge, or without wagons 128 lbs.

1089. Supporting power of boats.—The boats of the heavy train are of wood, of about 9½ tons displacement, and weigh 1,600 lbs. Each can carry 40 infantrymen armed and fully equipped besides its crew, a total of about 9,300 lbs. This load crowds the boat and should be used only in favorable conditions. In rough water or swift currents 20 men and the crew make a suitable load. The pontoon is cranky, and uneven loading and shifting of loads must be avoided.

The light or canvas pontoon is of 6 tons capacity and weighs 510 lbs. Its normal load is 20 men

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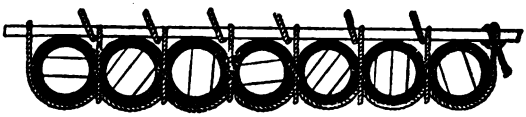

Fig. 171

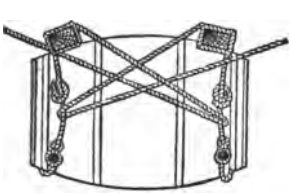

Fig. 172

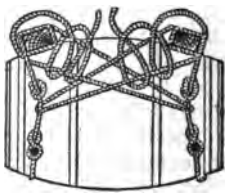

Fig. 173

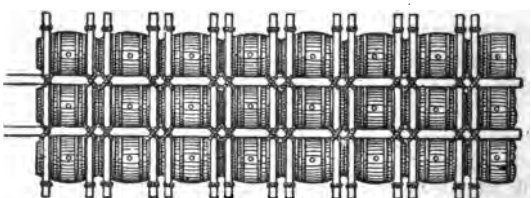

Fig. 174

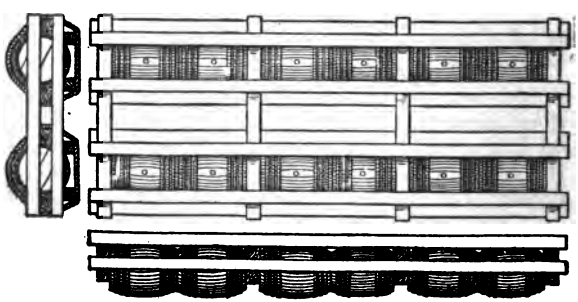

Fig. 175

and crew, which should be reduced for unfavorable conditions.

1090. The **supporting power** of the **bridge** is determined by that of the roadway, purposely

Fig. 179

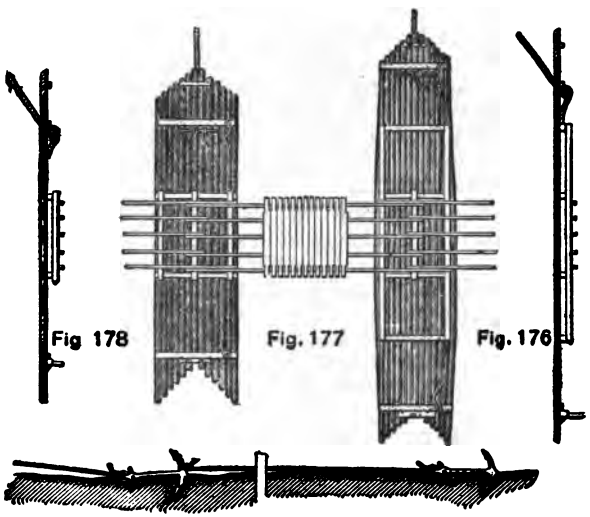

Fig. 180

made less than that of the pontoons. With a factor of safety of 4, the safe uniform load of the

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standard heavy bridge of 5 balks is 9,500 lbs, on the 14 ft. 4 ins. between the supports, or 660 lbs. per lin. ft. This is more than the weight of infantry armed and equipped in column of fours, but less than the weight of such a column if crowded by a check.

The corresponding concentrated center load is 4,750 lbs., which is about that on one axle of a wagon of 5 tons gross weight. It is more than the field gun and carriage and 1,675 lbs. less than the siege gun. Each additional balk above 5 adds 165 lbs. per ft. to the safe uniform load, or 1,280 lbs. to safe concentrated load. Seven balks will carry the siege gun with a factor of safety of nearly 4.

The above loadings should not be exceeded except under unusual circumstances and with great caution. With new and perfectly sound material in an emergency of actual service an officer in charge of a bridge would be justified in doubling the loads given, or, in other words, reducing the factor of safety to 2.

1091. Construction of floating bridges.—The regular bridge equipage is designed for unloading, construction, removal, and reloading in the shortest possible time, and its systematic drill is given in a separate manual. This elaborate drill is necessary only for troops handling the equipage habitually. The descriptions given of the methods of construction recommended involve the principles of the Pontoon Manual and are illustrated for the heavy equipage but are adapted in language to all kinds of floating bridges, the pontoon equipage being here considered simply as one kind of bridge of that class. The method selected will depend upon the character of the stream, the kind and location of materials, the force available, and the proximity of the enemy. It may be desirable to combine two or more of the methods described.

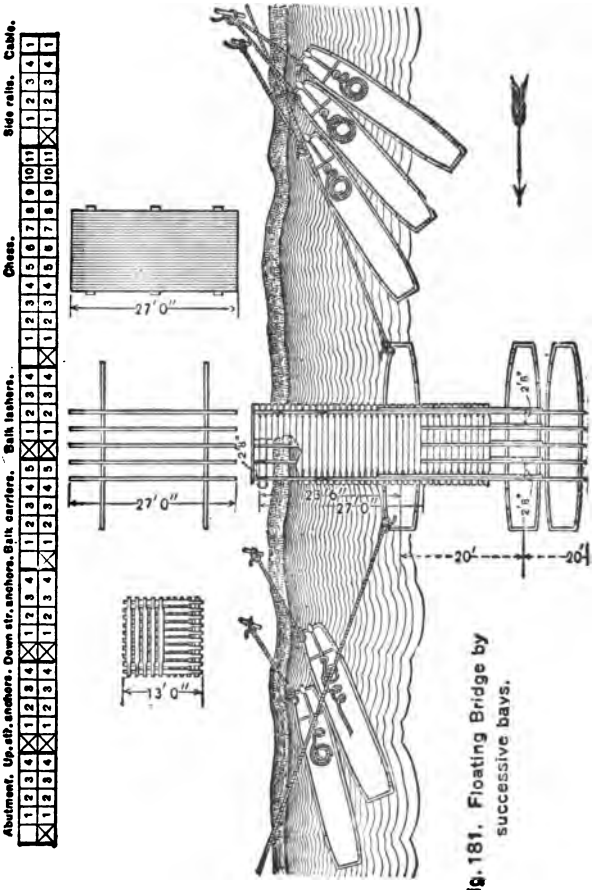

Fig. 181. Floating Bridge by successive bays.

A **tug** or **power launch** is of the greatest assistance and no effort should be spared to obtain one.

The three methods available are: 1. By successive bays; 2. By parts; 3. By rafts.

1092. By successive bays (Fig. 181).—In a trench 1 ft. deep and wide lay the abutment sill horizontal and at right angles to the axis of the bridge. Secure it by four large pickets, two in front and two in rear, near the ends. A support or pier, be it boat, barrels, or raft, is brought close to the bank opposite the abutment sill. The free ends of the cables, previously fastened on the bank 30 or more paces above and below, are passed on to the pier. A set of balks are brought up, the outer ends placed on the saddle sill of the pier and lightly secured. The pier is pushed off until the inner ends of the balks can be placed on the abutment sill, when all fastenings are completed. The floor is then laid on the balks placed, and the second pier is brought alongside of the first, its anchor having been previously cast. A second set of balks are brought up and the operation is repeated until the other shore is reached, where an abutment sill is laid as before described and the shore bay completed. Unless the supports are manageable boats, all anchors should be dropped from a special boat and the cables passed on to the piers.

1093. Construction by parts (Fig. 182).—For long bridges the method by successive bays requires materials to be transported considerable distances. These may be reduced by constructing the bridge in parts along the shore above. Each part may conveniently consist of three bays. To construct the parts a pier is moored close to the shore and gangways are temporarily laid to it from the bank. The other two piers are brought up outside the first and two bays are constructed successively, as above described, except that the outer

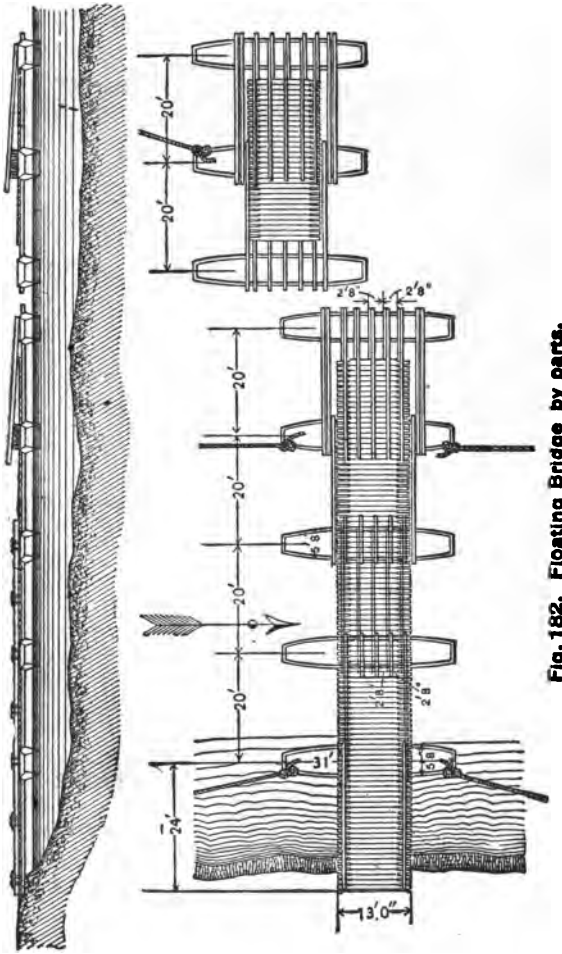

Fig. 182. Floating Bridge by parts.

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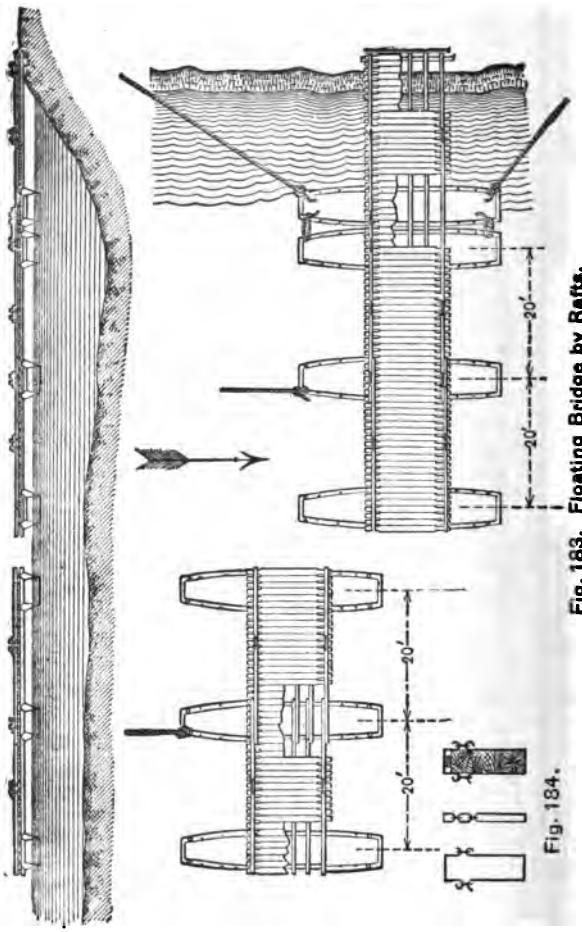

Fig. 183. Floating Bridge by Rafts.

Fig. 184.

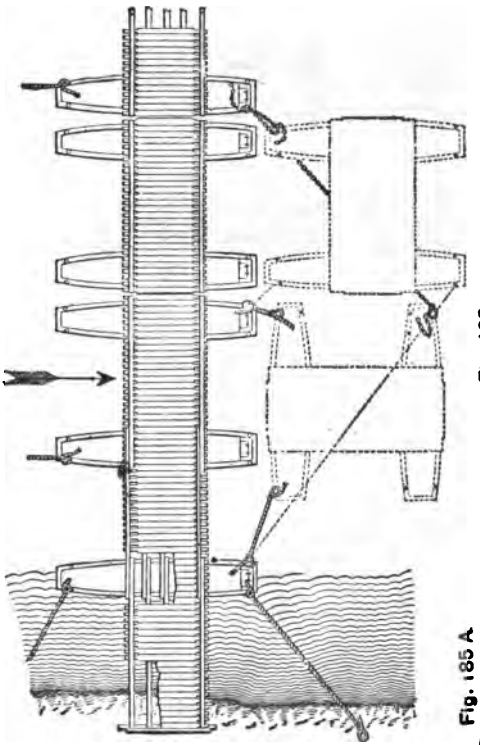

Fig. 186

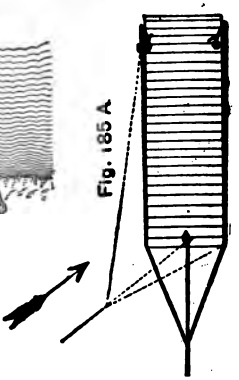

Fig. 185 A

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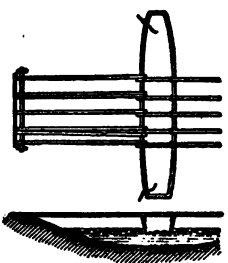

Fig. 186.

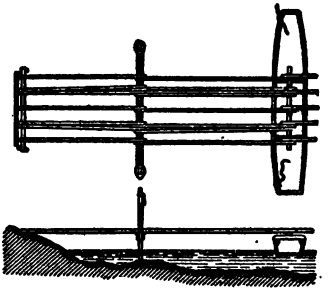

Fig. 187.

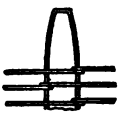

Fig. 188.

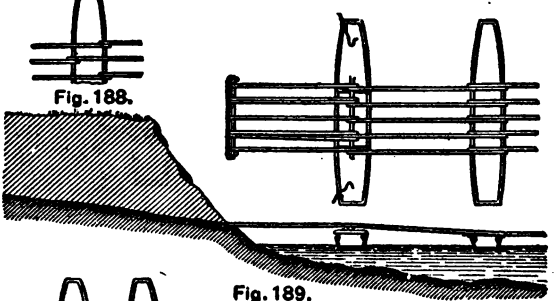

Fig. 189.

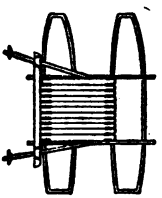

Fig. 190.

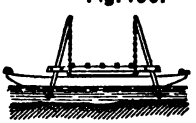

Fig. 193.

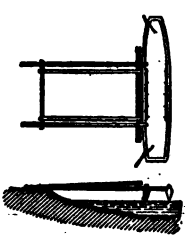

Fig. 191.

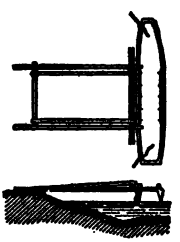

Fig. 192.

bay is constructed first and shoved out into the stream by the balks of the inner bay. Enough of the floor is omitted from each end of the part to permit fastenings to be made. The materials for the floor of one bay are loaded on the part thus formed, which is then pushed off and conducted to the line of upstream anchors, where it casts its anchors and drops down to its place in the bridge. If not easily manageable, the part may be swung out into the stream on an anchor previously laid.

An abutment will have been formed and one or more floating bays constructed during the construction of the part, a few planks being omitted from the outer end. The first part is brought into position opposite the shore end and connected to it by constructing one bay of roadway from the material loaded on the part. The other parts are joined in the same way until the opposite shore is reached, when an abutment bay is formed, as before described.

1094. Construction by rafts (Fig. 183).—Rafts differ from parts only in having the roadway completed. Rafts are assembled in the bridge with the outer piers of adjacent rafts in contact. The roadway is made continuous by connecting or false balks laid on top of the floor over the outer balks and connected to them to form a splice. For the heavy train, devices called rack collars are provided for clamping the false balks (Fig. 184).

This method is not often employed, as it requires more piers for the same length of bridge and distributes the support unequally, throwing the roadway into humps when loaded.

1095. Draw spans in floating bridges (Fig. 185).—To form a draw a raft is introduced into the bridge over the channel of navigation. The attachments of the false balks are adapted to convenient removal and replacement. To open the draw the raft is disconnected from the bridge, the

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upstream cables slacked off, the raft dropped out of the opening, made fast at one end to the bridge and allowed to swing around. If the current does not suffice, the raft must be moved by hauling on the downstream cables and on a swinging cable laid for the purpose. A wide draw in a strong current may be made of two rafts, one swinging on each end of the bridge.

VIII

Signal Corps and Signaling

Based on "The Service of Information" (Scriven), Drill Regulations for Field Companies of the Signal Corps, and Signal Corps Manual No. 3.

1096. The duties of the Signal Corps as established by law and as prescribed in Army Regulations are many and varied. While it is a staff corps by law, it is in reality also a line corps.

In peace the duties of this corps pertain in general to the staff, but in war they are so closely allied to the three arms of the service, that it becomes a part of the line. The value of the Signal Corps depends upon the use made of it by the line. Commanders of troops in the field should therefore be thoroughly familiar with the functions and powers of this corps. In war the primary function of this corps is "the speedy dissemination of military intelligence or information." The certain and speedy transmission of information and orders from commanding officers to their subordinates and information from subordinates to commanding officers, regardless of conditions or terrain, is the goal this corps must reach in war. The collection of military information, as with all branches of the service, is also a function of this corps, though of a secondary nature.

1097. The principles of the art of war have changed but little, if any, with the passage of time, but the science of war has changed, and will continue to change, with the general progress in scientific fields. In very recent years the use

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of electricity, the gas engine, and aerial navigation have worked wonders in the science of war. To-day speed and rapidity in all movements and operations is of the first importance. In the service of military information time and accuracy is therefore of the most vital importance to commanders in connection with their tactical and strategical operations. In our army the transmission of military information is, as has been said, wisely placed in charge of one corps—the Signal Corps—and not scattered among several branches of service.

1098. In the performance of its duties the Signal Corps establishes, maintains, and operates telegraph, telephone, buzzer, radio and visual lines of information, and operates the aeroplane, the dirigible, and captive balloon for obtaining and transmitting information. In addition to their use in the work of reconnaissance the use of air craft in observing and directing the fire of artillery has so increased the effectiveness of all forms of artillery fire as to make them the right arm of the artillery branch of the service. Nowadays artillery without aerial direction cannot accomplish its mission against a modern enemy. Information so obtained is transmitted to the firing batteries by means of various forms of visual signals, including forms of flight, by telegraph, telephone and radio.

It is readily seen that this corps, by virtue of its duties, is strictly a technical corps—a corps of specialists. In no branch of the service are the requirements of training in peace more exacting and in none are the chances of war more hazardous.

Training of Personnel

1099. The special qualifications required of Signal Corps troops in war are the ability, first, to be in position fully equipped with efficient men

and matériel to carry out the orders of the commanding officer; second, to maintain, uninterruptedly, such communication, either by electricity or visual signaling, or both, without regard to change of headquarters, as will keep the commander fully and continuously informed as to the progress of the action, the position of his troops, hospitals, trains, and supply departments.

To meet the first requirement, the Signal Corps must have men, technically trained in time of peace; and it must also be prepared to cover long distances as quickly as cavalry or artillery, and to overcome all the difficulties and obstacles of the route, and still keep in touch with such subordinate commanders as orders require.

To meet the second requirement the personnel must understand thoroughly all classes of signaling; must know how to repair the necessary matériel, and must be prepared to meet, tactically, the shifting requirements of the battle field and the strategical condition of the occupied territory. Mobility, thorough theoretical training, and extensive practice in establishing and maintaining lines of information over varied country under conditions approximating those of service, are the essentials.

1100. On account of the varied conditions that arise in handling Signal Corps troops, no hard and fast rules can be laid down to cover all conditions. As a consequence much is left to the energy and ingenuity of the officers and noncommissioned officers.

1101. Instruction in peace must therefore be conducted with a view, first, to drilling the personnel thoroughly in their habitual duties; and second, to affording officers and men practice and experience in dealing with the situations and difficulties apt to arise in campaign.

As signal organizations are usually mounted the instruction includes horsemanship to the extent

necessary to enable detachments and organizations to efficiently perform the mounted duties required of them.

When mounted the movements of the company and battalion conform in a general way to those of other mounted branches of the service.

When dismounted they conform to the movements of infantry.

ORGANIZATION

1102. Signal troops form a component part of the division, which is the fundamental army unit in which the several arms are combined for joint action in the field. Smaller organizations or detachments are supplied with signal troops as required. The Field Service Regulations and Tables of Organization, 1914, provide one field battalion and one aero squadron for each infantry division. An experienced signal officer is attached to the staff of the commanding general. His duties are to assist in the direction and coordination of the work of the signal troops in the service of information. The field battalion is commanded by a major and consists of one wire company, one radio company and one outpost company. The field battalion is equipped and prepared to furnish the interior communication within a division. The wire company is divided into four sections, each equipped for laying field wire in establishing buzzer communications with the brigades. The radio company is divided into four sections, two of these being pack radio sections and two wagon radio sections. The pack radio sections provide constant communication with the divisional cavalry, supply trains, and for other necessary communication where the laying of wire is impracticable. The wheel sets are for communication with other divisions, field-army headquarters, and base.

The outpost company is divided into four platoons, each equipped to supply the necessary interior communication within a brigade.

1103. Telegraph battalions are provided for field armies and larger bodies than the division. These battalions maintain service between the interior and the field army or connects the headquarters of the field army with its component parts. The battalion consists of two companies and is commanded by a major. Each company is divided into three telegraph and three telephone sections.

Instruments and Equipment

Radio Apparatus for the Mobile Army

1104. Radio Tractors: The tractors thus far developed are of 1 and 2 kilowatts capacity. The instruments and switchboards are installed in a specially designed covered body, which is mounted on the chassis of a commercial gasoline truck. Sufficient space is available for the transportation of a crew of ten men. By means of a special clutch and gear the engine is made to drive an alternator for furnishing the necessary electrical energy.

The mast and umbrella-type antennæ are raised by means of a shears located on top of the tractor. The average time required to place the set in operation is eight minutes. The larger set is intended for field army headquarters. The normal range for this type under the most trying atmospheric conditions is 100 miles. The smaller set, known as the divisional type, has a range of 50 to 150 miles depending upon atmospheric conditions.

1105. Radio Skid Sets: Two types of skid sets have been developed. These are intended for use in connection with army escort wagons or similar vehicles. In the smaller set (1 kilowatt) the engine and generator are mounted on skids and can

be carried by four men. In the larger type (2 kilowatts) the engine and generator are mounted on separate frames, but so constructed that they can be readily bolted together. The receiving and transmitting instruments and switchboard are carried in a fiber case about the size of an ordinary trunk.

Radio Pack Sets: Several models of pack sets have been developed.

The receiving and transmitting instruments of the latest type are contained in a case slightly larger than an ordinary suitcase. The electrical energy is supplied by a hand generator. A 40-foot sectional mast is used.

The set is normally packed on three mules, but in emergency may be packed on two.

THE BUZZER

1106. On our field lines the buzzer in one of its forms is almost universally used. This instrument was introduced into our service about 1890 and first showed its capabilities in the Philippine and China campaigns. In its present forms of "field buzzer," and still more portable "cavalry buzzer," it combines in a small leather case weighing a few pounds a complete telegraph and telephone station, including the necessary batteries. Its capacity for working over circuits impossible for any other telegraph instrument, such as bare-wire lines laid on the ground, through wire of wire fences, or railroad rails, or, more incredible still, through considerable breaks in the line when the ends lie on the ground, makes it the ideal instrument for field lines.

To open a station it is necessary only to fasten the buzzer connector with flexible cord from one binding post to the field wire, and from the other binding post a flexible wire leads to a small ground rod or metal peg driven into the ground. In

emergencies the ground wire may be held in the hand, or when used mounted may be connected to the horse by a small metal plate under the saddle blanket.

By working the key an interrupter is operated giving a high singing note, which is broken up into the dots and dashes of the Morse alphabet. These correspond to vibratory electrical impulses which go out on the line and are heard in the telephone receiver at the distant station. The efficiency of the buzzer under the difficult conditions stated is due to the marvelous sensitiveness of the telephone receiver to these rapidly pulsating currents. In practically the same circuit as the interrupter is a telephone transmitter, and when the button switch on this is depressed the instrument becomes at once converted into a very efficient telephone set.

The cavalry buzzer is the lightest, weighing about 4½ pounds, and comparable to a good-sized field glass in dimensions. It has not so much power as the field buzzer, which is about 50 per cent heavier and bulkier. For buzzer telegraphy over difficult lines the field buzzer's superior power will probably make it the preferable instrument.

THE FIELD TELEPHONE

1107. This instrument has all the power of the most complete telephone. The box is very strong and weatherproof and has a strap for convenience in carrying. The transmitter and receiver are attached to a handle containing a switch, which is depressed by the fingers and brings the battery into operation when talking. The connections are very simple and easily repaired when deranged. It can be connected to field lines and the ground in the same way as the buzzer. Its commonest use, however, is for camp lines where, with its generator and call bell, it is specially suited

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for connection with the field switchboard. This latter instrument has ten drops and can take care of connections with 10 lines, or more telephones if party lines are practicable. This switchboard uses cams for making connections, instead of the cords and plugs of the commercial switchboards, thus saving greatly in bulk and securing greater portability.

CAMP TELEPHONE

1108. This instrument was designed particularly for use in camps, but it can be used for permanent or temporary installations. It is of the local battery type. In stormy weather it can be operated with the cover closed. The transmitter and watchcase receiver form a unit, termed a hand set, and are mounted on a metal base.

CAMP TELEPHONE SWITCHBOARD

1109. This 40-drop switchboard is the result of years of development and the principle advantages claimed for it on camp telephone systems are compactness, portability, and stanchness. It has proved to be very efficient in camp service. When taken down for transportation or storage it resembles a small chest.

TELEGRAPH INSTRUMENTS

1110. Base lines and other permanent telegraph lines will, of course, make use of the familiar commercial apparatus. Morse instruments of various portable forms, such as the box relay, main-line sounder, or pocket relay, will be used on semipermanent lines wherever practicable. These require, however: large battery equipment and well-insulated lines, and in bad weather the instruments are difficult to keep in adjustment.

FIELD INDUCTION TELEGRAPH

1111. On semipermanent lines, especially where business over them is heavy, the continual use of

the buzzer is very fatiguing to Morse operators. The field induction telegraph set, permitting the use of the ordinary sounder, has been devised especially for this class of lines. The case, furnished with a carrying strap, weighs about 12 pounds. In this are a polarized relay, sounder, key, four cells of dry battery, and a special form of induction coil. By means of this induction coil the operation of the key sends out impulses of high voltage over the line and relays. These relays are very sensitive and operate with a remarkably small current. As a result of the voltage increase and relay sensibility, three of the dry cells will work the sets over hundreds of miles of iron wire, over ordinary circuits where the insulation leakage permits the escape of 95 per cent of the current. Doing away as it does with carrying large amounts of battery, it is believed to be a useful intermediate instrument between the buzzer and the regular telegraph installation.

FIELD WIRE

1112. The wire used for lines of communication in the field has been reduced to four types, namely, field, buzzer, outside distributing, and galvanized iron.

The field type is a rubber insulated and braided strand composed of ten steel wires and one copper wire having a tensile strength of not less than 300 pounds and weighing about 75 pounds to the mile. It is very pliable and lies flat on irregular ground. Its strength and insulation are little impaired by wagons and troops passing over it. It is laid and recovered by means of wire carts and is used principally for telephone and buzzer work.

Buzzer wire is a conductor composed of two steel strands and one copper strand, double cotton covered, and impregnated with an insulating compound. It is supplied in half-mile lengths and is

usually laid by means of a hand reel, operated by a mounted soldier. It is recovered by means of breast reel.

Outside distributing wire is a twisted pair and consists of a steel core plated with copper. The steel is used for strength and the copper for conductivity. It is rubber insulated and braided and has a tensile strength of about 150 pounds. It is used chiefly for telephone purposes, as for lines between switchboard and instruments.

Galvanized iron wire is used for long semipermanent telegraph or telephone lines and is strung on insulated supports, such as poles and brackets attached to trees. It is usually 12 or 14 gauge.

FIELD TRANSPORTATION

1113. In addition to wagons and packs for ordinary transportation, the Signal Corps has found it necessary to devise some special vehicles for transporting and laying wire and carrying such equipment as wireless sets, lances, etc.

The most important of these is the pintle type wagon and the wire cart from which wire may be paid out at a gallop and reeled up almost as speedily. In the latest model the front element of the vehicle carries the reel and wire, and is known as the reel cart. The rear element, known as the signal cart, is a chest of compartments suitable for carrying the buzzers, batteries, flags, field glasses. and other equipment used by field companies of the Signal Corps. The rear signal cart may be detached from the reel cart, and the former used alone in laying and recovering wire. The pintle type wagon is drawn by four horses. The signal cart chest is capable of being moved forward and backward to adjust weight on the horses' necks.

In case neither of these vehicles are available, field wire lines may be laid and recovered by means of escort wagons and ordinary "barrow" reels.

For handling the small insulated buzzer wire, which is furnished on one-half mile spools, the pay-out handles and breast reels answer every purpose either on foot or mounted.

The instrument wagons are spring wagons provided with paulins or wagon sheets, in which instruments, light tools, repair parts, etc., may be transported.

The lance truck is a wagon with a high seat and long reach, suited for the transportation of lances 18 feet long. Four mules suffice for this load under ordinary conditions.

Special pack chests are provided for the Signal Corps supplies, and the present field wireless pack set, which is carried on three mules, requires special fittings for the aparejos.

Visual Signaling Equipment

Flag kits, general service and semaphore

1114. Three kinds of flag kits are issued by the Signal Corps for use with the General Service Code and the Two-arm Semaphore Code; the combination, standard, 2-foot kit; the combination infantry, 2-foot kit; and the standard 4-foot kit.

1115. The combination, standard, 2-foot kit.—The combination, standard, 2-foot kit consists of 1 case, canvas; 1 staff, 3-joint; 1 flag, red, white square; 1 flag, white, red square; 2 staffs, semaphore; and 2 flags, semaphore, standard. The red flag is made of red galatea, 2 feet square, with an 8-inch white center. The white flag is of similar size and material, the only difference being an alternation of colors in the body and center. The means of attachment to the staff consists of a loop at the center and two ends of white tape at each edge of the back of the flag body. The staff for these flags is made of hickory in three joints, each

joint being 23 inches long, and is assembled by means of a brass screw ferrule. Brass eyes are provided on the first and second joints to receive the tape ends at the edge of the flag. The semaphore flags are 18 inches square, divided diagonally into two parts, one of red and the other white, the red portion constituting the upper half of the flag. The staffs are 24 inches long. The carrying case is of convenient size and shape to carry the flags and staffs above enumerated and is bound with leather and fitted with shoulder straps.

1116. **The combination infantry, 2-foot kit.**—The combination, infantry, 2-foot kit is essentially the same as the combination, standard, 2-foot kit, except that 1 infantry flag is substituted for the two 2-foot red and white flags above described.

1117. **The standard 4-foot kit.**—The standard 4-foot kit consists of 1 case, canvas; 1 staff, 3-joint, and 1 flag, red, white square; and 1 flag, white, red square. The flags are 3 feet 9 inches square, with 12-inch centers, and the staffs are considerably heavier than those of the standard 2-foot kit, each joint being 36 inches long. The 4-foot kit is the standard field flag kit, and the range at which signals can be exchanged with it depends on a variety of factors, such as conditions of the weather, the location of stations, the proficiency of signalmen, etc. The speed for continuous signaling is seldom greater than five to six words per minute.

1118. **Powers and limitations of flag signaling.**—The advantages which may be claimed for this method of signaling are portability of apparatus, adaptability to varied weather conditions, and great rapidity of station establishment. The disadvantages are the lack of celerity of the signals, their impenetrability to dust or smoke, and the comparatively short ranges at which they can be

read. These ranges vary with the background, light, vision, and power of glasses if used.

HELIOGRAPH

1119. This method of signaling employs the concentration and reflection of the sun's rays by means of mirrors. The heliograph as originally designed abroad did not possess the features necessary to make its operation entirely successful, but in the present type developed by the Signal Corps many improvements have been made, so that it is now a reliable medium for visual signaling. The mirrors are supported on tripods.

The latest type of heliograph consists of a screen designed to operate a shutter and control the flash reflected from an immobile mirror. All parts are carried in a leather pouch with shoulder strap.

The range of signaling depends entirely on atmospheric conditions and suitable terrain. Under favorable conditions good results at distances of 30 miles have been obtained, but the heliograph has been known to work at much greater distances. The rate of transmission is from five to twelve words per minute.

ACETYLENE LANTERN

1120. This is a night-signaling lantern ordinarily supported on a tripod. The carbide generator is hung from the apex of the tripod and the gas flows through a soft rubber tube to the lantern. The lantern is equipped with a special aplanatic lens mirror. Signals are made by depressing a key that opens a gas valve and causes the ordinarily dim light to flare up. Messages can be sent a distance of about 20 miles. The rate of transmission is about the same as with the heliograph.

LINES OF INFORMATION

1121. This general term has been adopted to apply to the means by which military messages are transmitted between two or more stations.

Under modern conditions lines of information are nearly always operated electrically. On account of its certainty, secrecy, and speed, telegraphy over wire lines is to-day without a rival for use on military as well as commercial lines.

As an army advances into hostile or conquered territory it will utilize as far as possible existing commercial lines to connect it with its base. If lines are constructed, they will generally at first consist of the insulated wires laid on the ground which follow the advance. Such of these as are needed will subsequently be put up as light lines on lances, afterward to be converted into permanent pole lines where necessary. Lines of a temporary character will be constructed or laid connecting the camps. When the army goes into action, an important series of lines are required connecting the commanding general, the corps, division, and brigade commanders, the artillery, and probably important points of observation and control at other places on the line.

1122. Classified as to their construction, lines of information are permanent, semipermanent, or field lines.

Permanent lines are those similar in construction to the standard telegraph lines, and usually consist of heavy, bare copper or galvanized iron wire. No. 9 galvanized wire is the standard in our service. These wires are supported on substantial insulators and strong poles. Such lines are generally operated with the standard relays and sounders familiar in commercial offices.

Semipermanent lines consist of lighter bare wires, usually No. 12 or No. 14 galvanized, sup-

ported on lighter poles called lances, or on light tubular iron poles. These lances are fitted with hard rubber or composition insulators. Lines such as these were formerly the standard military construction, and telegraph trains, consisting of wire wagons, battery wagons, and lance trucks, could construct from 7 to 15 miles of these lines a day, depending on conditions. These lines were generally operated with box relays, but in modern use the telephone would frequently be the instrument employed.

Field lines are those laid hastily for temporary use, and usually consist of insulated wire paid out from reels on carts or wagons or in the smaller size wire from hand reels. Sometimes bare wire is used, in which case only the "buzzer" will operate satisfactorily over them. This buzzer is generally used on all field lines, although the field induction telegraph kit may be substituted for it under many conditions.

1123. Classified in regard to their use, lines of information may be considered as either strategical or tactical lines.

Strategical lines are usually of the permanent or semipermanent character, and may be part of the commercial system of the country. They are "base lines" in general, as they lie behind the advancing army and maintain communication with the base and thence to the seat of government. On account of their importance they would frequently be duplicated, and in general over different routes, to insure communication under all conditions. They would in some cases include important submarine cables or even large wireless stations.

Tactical lines are generally of the field line class and are rapidly laid or taken up to follow the movement of the units they connect. Their name indicates their uses. They are the "combat lines"

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which late improvements in wire, transportation and instruments have made possible.

Lines of Information for a Division or an Army

1124. The necessity for lines of information begins with the concentration and mobilization of troops in camp whether in the theatre of operations or not. The radio tractor sets assigned to divisions and field army headquarters will first be put in service by the radio companies. Then at the division or army headquarters a central station will be established by the telegraph companies, if the command is larger than a division, and connected with the most convenient telegraph and telephone lines of the commercial lines of the country or with the base. The wire companies will then extend telephone or buzzer lines from division centrals to brigade headquarters, the camps of the cavalry, engineer and signal troops, field artillery, field hospitals, supply depots, independent commands, etc. The outpost companies then continue the lines to regimental and battalion headquarters and if in the theater of operations to outposts, observation stations, and trenches.

1125. The telephone is the ordinary means of communication between fixed stations within the divisional camp. The telegraph and radio for more distant work. The temporary buzzer or field wires are laid to changing posts at the front or on the flanks, to the outposts, observation stations, aero stations, trenches, etc. In brief, every important point will be connected with division headquarters, the whole command being linked together by a fanlike skeleton of wires and connected with the base and the larger commands by wire or radio.

1126. On the march fewer lines of information are possible and the radio and aeroplane must

furnish the bulk of the information. Every possible use is made of the commercial lines. The division on the march must maintain constant electrical communications with its base. As the advance progresses the telegraph trains must establish telegraph lines in rear of the division if no commercial lines are available. The lines are first established as lance lines and later by more permanent construction if required. After contact with the enemy, the service of information becomes more exacting and the maximum requirements are attained after hostilities begin. Buzzer lines will then be carried forward to the brigades, regiments, battalions, to the infantry and artillery on the firing line, to observation stations, captive balloons, and aeroplanes. The radio will then furnish the best means of communication with the cavalry. The energy, ability, and resourcefulness of the signal corps will then be taxed to the limit as positions change and wires are cut by the enemy's fire. The communications desired by the commanding officer must be maintained at all hazards. The situation will require the use of every means of transmitting information. Ample provision will be made for the service to the rear, including the sanitation, ammunition, and supply services.

Laying Field Lines

1127. Field wire is carried on 5-mile reels, and is ordinarily paid out at a trot or gallop from the wire carts or wagons. In case neither of these vehicles are available, field wire lines may be laid and recovered by means of escort wagons and ordinary "barrow" reels. The wire should be laid to one side of the roadway and plenty of slack being allowed for turns in the road and also to permit its dropping from the feet of animals passing over it without breaking the wire or throwing the animal. In crossing railway tracks, the wire will

be cut and passed under the rails. In passing through villages the wire will be placed overhead on telegraph poles, houses, etc. The wire carts are followed up by mounted linemen provided with wire pikes, who place the wire out of harm's way along the road or trail or fasten it up to trees, poles, and structures. If the line is to be used for some time, the wire is later fastened to lance poles or others of a more permanent nature.

Buzzer wire is laid by means of hand-reels carried by men on foot or mounted men at the trot or gallop. It is used for short lines or for emergency lines over rough ground where the heavier field wire cannot be carried. The buzzer may be carried on the wire cart or on horseback and communications maintained as the line progresses. In emergencies the buzzer will operate over long stretches of bare wire laid on the ground, through the wire of fences, railroad rails, or through considerable breaks in the line when the ends lie on the ground.

For effective wire communication good grounds at the instruments are essential. Moist earth should be sought. In dry places the most favorable locations are near the roots of trees, bushes and grass. A satisfactory ground may be obtained through a rod driven into a growing tree. In emergencies the buzzer can be used by holding the ground wire in the hand or when mounted by connecting it to a small metal plate placed under the saddle blanket next to the animal's skin.

Telegraph lines of bare wire may be laid hastily in the same manner as field wire, the wire being supported by lances or other forms of poles with insulators.

Good insulation is required for the use of ordinary Morse instruments, though for the field induction set good insulation is not so essential.

1128. It is the duty of all persons in the field to assist in the protection and maintenance of field lines, and when lines are found to be cut or broken they should be repaired by tying the ends together in a hard knot, leaving about a foot of each end free.

The insulation is then removed from the ends for several inches and the bare wire twisted together. The knot should be drawn up tight before leaving the temporary splice.

Selection of Instruments

1129. It thus appears that the buzzer, the telephone, and telegraph each has fairly well defined rôles in operating electrical lines of information. The buzzer is the pioneer which clears the way, follows up the fighting line, and can operate over any kind of a line. Its function as a telegraph instrument is the paramount one on account of its reliability, although as stated it is a good telephone when the wire is in proper condition. The field telephone is most useful in camp administration lines or over semipermanent lines in general, where telephone service seems desirable.

The telegraph is standard where lines are established and where the volume and importance of business becomes great. To the trained operator there is nothing to equal the clearness and certainty with which a message on a Morse sounder is delivered, and such operation is the ultimate excellence toward which military lines aim.

The decision as to when the telephone or telegraph should be installed or used is governed by the following considerations:

The telephone does not require trained operators.

The telephone may be used for direct, and consequently confidential, communication between officers.

Time is saved, compared with telegraphy, especially when the users are accustomed to the telephone.

The telegraph is superior to the telephone in the following ways:

Accuracy.—A written message, spelled out by telegraphy, written and delivered, has an obvious advantage over one delivered by word of mouth.

Reliability.—In the field, especially when the wind is blowing in the ears and various other noises tend to confuse, it is very hard to distinguish in the telephone words which sound alike. This is especially confusing to an enlisted man unused to expressions common in military messages. The sharp signals on the buzzer or sounder are much more reliable.

Speed.—It is found in the case of written messages transmitted by buzzer and telephone, that, owing to frequent repetitions required by telephone, the buzzer will generally exceed it in speed.

From the foregoing considerations, it is evident that officers should, when time permits, always write out their messages in proper form. The use of the telephone should be restricted to communication between officers. The direction to an operator verbally to send messages by telegraph is very inadvisable. Sending messages by dictation through the telephone invites almost certain errors.

Army Signaling

(Signal Book, United States Army, 1916)

General Instructions for Army Signaling

1130. Each signal station will have its call, consisting of one or two letters, as Washington, "W"; and each operator or signalist will also have his

personal signal of one or two letters, as Jones, "Jo." These being once adopted will not be changed without due authority.

1131. To lessen liability of error, numerals which occur in the body of a message should be spelled out.

1132. In receiving a message the man at the telescope should call out each letter as received, and not wait for the completion of a word.

1133. A record of the date and time of the receipt or transmission of every message must be kept.

1134. The duplicate manuscript of messages received at, or the original sent from, a station should be carefully filed.

1135. In receiving messages nothing should be taken for granted, and nothing considered as seen until it has been positively and clearly in view. Do not anticipate what will follow from signals already given. Watch the communicating station until the last signals are made, and be very certain that the signal for the end of the message has been given.

1136. Every address must contain at least two words and should be sufficient to secure delivery.

1137. All that the sender writes for transmission after the word "To" is counted.

1138. Whenever more than one signature is attached to a message count all initials and names as a part of the message.

1139. Abbreviations of weights and measures in common use, figures, decimal points, bars of division, and in ordinal numbers the affixes "st," "d," "nd," "rd," and "th" will be each counted as one word. Letters and groups of letters, when such groups do not form dictionary words and are not combinations of dictionary words, will be

counted at the rate of five letters or fraction of five letters to a word. When such groups are made up of combinations of dictionary words, each dictionary word so used will be counted.

1140. The following are counted as shown:

A. M.	1 word
P. M.	1 word
O. K.	1 word
Per cent	1 word

1141. No message will be considered sent until its receipt has been acknowledged by the receiving station.

The American Morse Code

1142. The American Morse Code will be used officially by the army in the operation of land telegraph lines, short cables, and field telegraph lines. It is written as follows:

Alphabet

A	•—	O	— — —
B	—•••	P	•••••
C	—•—•	Q	••—•
D	—••	R	•—•
E	•	S	•••
F	••—•	T	—
G	——•	U	••—
H	••••	V	•••—
I	••	W	•——
J	•———	X	—••—
K	—•—	Y	—•——
L	•—••	Z	——••
M	——	&	•—•••
N	—•		

Numerals

1	•————	6	—••••
2	••———	7	——•••
3	•••——	8	———••
4	••••—	9	————•
5	•••••	0	—————

Punctuation

Period		•—•—•—
Comma		——••——
Interrogation		••——••
Hyphen	(HX)	—••••—
Dash	(DX)	—••••—
Parenthesis (begin)	(PN)	—•——•
Parenthesis (end)	(PY)	—•——•—

Quotation marks (begin)	(QN)	. . — . — .
Quotation marks (end)	(QJ)	. . — . — . — . — .
Dollar mark	(SX)	. . . . — . .
Decimal point		Spell "dot."
Capitalised letter	(CX)	. . . — . .
Brackets	(BX)	— . . . . — . .
Colon	(KO)	— . — — . .
Semicolon	(SI)	. . . . .
Underline (begin)	(UX)	. . — — . — . .
Underline (ans)	(UJ)	. . — — — . — .
Colon dash	(KX)	— . — — . — . .
Colon followed by quotation	(KQ)	— . — — . . — .
Exclamation point	(!)	— — — — .
Fraction bar	(/)	.
Paragraph mark	(¶)	— — — —
Pounds, sterling	(£)	(PX) . . . . . . — . .
Shilling mark	(UT)	. . — —

Abbreviations

af	after	nite	night
ahr	another	nl	night letter
b	be	npr	night press rate
bf	before	ob	official business
bn	been	pd	paid
ck	check	r	are
cn	can	t	the
da	day	u	you
dl	day letter	ur	your
dpr	day press rate	w	with
fm	from	wrd	word
gn	good-night	x (in check)	get a reply to this message
govt	government	5	Have you anything for me?
hr	hear or here	13	understand?
hv	have		
msg	message		

CONVENTIONAL SIGNALS FOR USE WITH THE AMERICAN MORSE CODE

1143. The following conventional signals will be used on military telegraph lines, short cables, and field lines:

Attention, all operators	(9)	— . . —
Please start me (or) where shall I start	(4)	. . . . —
Wait a moment	(MIN)	— — . . — .
Official message	(OFM)	. . — . — —
I understand	(OK)	. . — . —
Busy on other wires	(25)	. . — . . — — —
No more	(NM)	— . — —
Test, give away	(WIRE)	. — — . . . . .
Break	(BK)	— . . . — . —
Go ahead	(GA)	— — . . —
Error	(DN)	— . . — .
Signature follows	(SIG)	. . . . . — — .

TRANSMISSION BY AMERICAN MORSE

1144. The sending operator will enter the time when the message is handed him for transmission, in the left-hand corner at the bottom of the blank opposite the word "Received." He will enter in the proper places, at the head of the blank, the number of the message, the call letter of his station, with his personal signal, the check (number of words or groups of cipher contained in message, counting address and signature), and after "O.K." has been received he will enter the time the message was sent and the call letter of the receiving station, with the personal signal of the receiving operator.

1145. To transmit a message the operator will send (1) the number of the message and call letter of his station; (2) his personal signal; (3) the check; (4) "fm," followed by the name of the sending detachment; (5) "at," followed by the location of the sending detachment and date; (6) "ho," followed by the hour (a. m. or p. m.) message was written; "No." (Sender's serial number); (7) "to," followed by the address in full; (8) period (..———..); (9) body or text of the message; (10) "sig," followed by the signature of the message.

The International Morse or General Service Code

1146. The International Morse Code is the General Service Code and is prescribed for use by the army of the United States and between the army and the navy of the United States. It will be used on radio systems, submarine cables using siphon recorders, and with the heliograph, flash-lantern, and all visual signaling apparatus using the wigwag.

Alphabet

A	·—	N	—·
B	—···	O	———
C	—·—·	P	·——·
D	—··	Q	——·—
E	·	R	·—·
F	··—·	S	···
G	——·	T	—
H	····	U	··—
I	··	V	···—
J	·———	W	·——
K	—·—	X	—··—
L	·—··	Y	—·——
M	——	Z	——··

Numerals

1	·————	6	—····
2	··———	7	——···
3	···——	8	———··
4	····—	9	————·
5	·····	0	—————

Punctuation

Period	·· ·· ··
Comma	·—·—·—
Interrogation	··——··
Hyphen or dash	—····—
Parentheses (before and after the words)	—·——·—
Quotation mark (beginning and ending)	·——·—·
Exclamation	——·—·—
Apostrophe	·————·
Semicolon	—·—·—·
Colon	———···
Bar indicating fraction	—··—·
Underline (before and after the word or words it is wished to underline)	··——·—
Double dash (between preamble and address, between address and body of message, between body of message and signature, and immediately before a fraction)	—···—
Cross	·—·—

SIGNALS FOR USE WITH INTERNATIONAL CODE

1147. The following signals will be used by radio stations of the United States army:

Distress signal (ship stations only)	···———···
Attention (or call)	The call is composed of the attention signal —·—·— followed by the call letters of the station called, repeated three times (if unknown use CQ (——·—· ———·—) in place of call letters of station called), followed by DE (—·· ·) and then the call letters of the calling station, repeated three times.
Have you anything for me	QRU (———·— ·—· ··——)
How many words have you to send	QRJ (———·— ·—· ·————)
Invitation to transmit (go ahead)	—·—
Signal separating preamble from address, address from text, and text from signature	—·—·—
End of message	·—·—·
End of work	···—·—, followed by the call letter of sending station and —·—

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Received (acknowledgment of receipt of message)	R (. — .), followed by the call letter of the receiving station and personal signal of the receiving operater.
Here is another message	— . — — (attention call).
Understood (or I understand)	. . — ., followed by the call letters of station.
Not understood (or repeat)	. . — — . . (Interrogatory) and the last word received.
Error	. . . . .
Wait	. — . . .
Official message	OFM (— — — . . — . — —)
(First word of preamble on all radiograms)	RADIO (. — . . — — . . — — — — —)
Faster	QRQ (— — — . — . — — . — — . —)
Slower	QRS. (— — — . — . — . . .)
Stop sending	QRT (— — — . — . — . —)
Interference	XX (— . . — — — . — —)
Use International Code of Signals	PRB (. — — —. . — — . — . . .)
General inquiry call (when call of station is not known)	CQ (— — . — — — . — —) (see attention call).
How do you receive me	QRK (— — — . — . — — . — —)

TRANSMISSION OF MESSAGES BY INTERNATIONAL MORSE EXAMPLE

1148. WVB sending to WVA a plain commercial message filed at 4 p. m., of the 12th, after receiving — . —

— . — —	
RADIO	
Circle City	Office of destination.
De.	
Fairbanks	Office of origin.
2	Number of message.
L	Operator's sign.
8	Check.
Twelfth 4 pm	Date and hour of filing.
— . . . —	Break or double dash.
Brown 175 King Street	
Circle City	Address.
— . . . —	Break.
Arrive tomorrow	Text.
— . . . —	Break.
Jones	Signature.
. — — .	
KMO	
— . —	

VISUAL SIGNALING IN GENERAL

1149. Methods of visual signaling are divided as follows:

(a) By flag, torch, hand lantern, or beam of searchlight (without shutter). (General Service Code.)

(b) By heliograph, flash lantern, or searchlight (with shutter). (General Service Code.)

(c) By Ardois. (General Service Code.)

(d) By hand flags or by stationary semaphore. (Two-arm semaphore Code.)

(e) By preconcerted signals with Coston lights, rockets, bombs, Very pistols, small arms, guns, etc.

(f) By flag signals by permanent hoists. (International Code.)

1150. The following conventional signals, with exceptions noted, will be used in the first four classes:

		Exceptions. Ardois and semaphore.
End of word.	Interval.	
End of sentence.	Double interval.	
End of message.	Triple interval.	
Signal separating preamble from address; address from text; text from signature.	— . . —	Double interval, signature preceded also by "Sig." Interval.
Acknowledgement.	R.	
Error.	. . . . .	A.
Negative.	K.	
Preparatory.	L.	
Annulling.	N.	
Affirmative.	P.	
Interrogatory.	. . — — . .	O
Repeat after word.	Interrogatory, A (word).	
Repeat last message.	Interrogatory three times.	
Send faster.	QRQ	
Send slower.	QRS	
Cease sending.	QRT	
Wait a moment.	. — . . .	None.
Execute.	IX, IX	
Move to your right.	MR	
Move to your left.	ML	
Move up.	MU	
Move down.	MD	
Finished (end of work)	. . . — . —	None.

Note.—In order to differentiate these signals from important battle signals, the navy uses certain distinguishing variations which are not necessary in signaling in the army. In making the conventional signals for "A," Error, and "O," Interrogatory, in Ardois, the navy indicates them by pulsating the upper light, in making them in semaphore, by agitating the arms or flags. "K," Negative; "L," Preparatory; "N," Annulling; "O," Interrogatory; and "P," Affirmative, in the navy are secondary meanings, and used only in connec-

tion with Navy Code Books. They should not be used in communication between the army and navy.

In communicating with the navy, by all methods, numerals will be spelled out.

"Intervals" are expressed as follows in the various systems:

	Interval.	Double interval.	Triple interval.
Radio. Flashing. Occulting light. Sound.	— space.	.. .. ..	.—.—.
Wigwag.	Front.	(Twice.)	(3 times.)
Semaphore.	Flags crossed or machine closed.	2 chops.	3 chops, withdraw flags or close machine and indicator arm.
Ardois.	.—.—	(Twice.)	(3 times.)

Visual Signaling: by Flag, Torch, Hand Lantern, or Beam of Searchlight (Without Shutter)

GENERAL SERVICE CODE

1151. For the flag used with the General Service Code there are three motions and one position. The position is with the flag held vertically, the signalman facing directly toward the station with which it is desired to communicate. The first motion (the dot) is to the right of the sender, and will embrace an arc of 90°, starting with the vertical and returning to it, and will be made in a plane at right angles to the line connecting the two stations. The second motion (the dash) is a similar motion to the left of the sender. The third motion (front) is downward directly in front of the sender and instantly returned upward to the first position. Front is used to indicate an interval.

1152. The beam of the searchlight, though ordinarily used with the shutter like the heliograph, may be used for long-distance signaling, when no shutter is suitable or available, in a sim-

ilar manner to the flag or torch, the first position being a vertical one. A movement of the beam 90° to the right of the sender indicates a dot, a similar movement to the left indicates a dash; the beam is lowered vertically for front.

1153. To use the torch or hand lantern, a footlight must be employed as a point of reference to the motion. The lantern is most conveniently swung out upward to the right of the footlight for a dot, to the left for a dash, and raised vertically for front.

Signaling with Heliograph, Flash Lantern, or Searchlight (with Shutter)

General Service Code

1154. The first position is to turn a steady flash on the receiving station. The signals are made by short and long flashes. Use a short flash for dot and a long steady flash for dash. The elements of a letter should be slightly longer than in sound signals.

1155. To call a station make its call letter until acknowledged.

1156. If the call letter of a station be unknown, signal A until acknowledged. Each station will then turn on a steady flash and adjust. When the adjustment is satisfactory to the called station, it will cut off its flash, and the calling station will proceed with its message.

1157. If the receiver sees that the sender's mirror or light needs adjustment, he will turn on a steady flash until answered by a steady flash. When the adjustment is satisfactory, the receiver will cut off his flash and the sender will resume his message.

1158. To break the sending station for other purposes, turn on a steady flash.

1159. It may be noted that in the daytime and in ordinary weather the searchlight with shutter can be readily used for distances up to 10 miles at sea.

This method of day signaling is considered of exceptional value by the navy, and is commonly used by the coast artillery in target practice from the shore to the tug towing the target. It is independent of background and may be used behind armor or other shelter; it should be frequently used for signaling by day as well as by night.

The Ardois System

GENERAL SERVICE CODE

1160. The Ardois system, used in the United States Army and Navy, is a display of four lights, each of which may be made either red or white. These lights are incandescent lamps, operated by a keyboard conveniently placed at the station. The red light indicates a dot and the white light a dash, so that the characters of the General Service Code are made by combinations of red and white lights.

1161. If the lights are arranged vertically, as when swung from a staff or spar, they are read from the top downward. If the lights are placed horizontally, they are read from the sender's right to his left.

1162. Example: Red-white, or dot-dash, represents the letter A; and white-red-red-red, or dash-dot-dot-dot, represents the letter B.

1163. For numerals in the Ardois system, secondary meanings (as numerals) have been assigned to the last 10 letters, Q being 1, R being 2, and so on, Z being 0. These secondary meanings are not used in communicating with the navy; when communicating with the navy the

numerals of the International Morse Code must be spelled out in full.

1164. When the letters of the alphabet are to be used to indicate the meaning set opposite them, the upper light of the display is pulsated. This is effected by means of a special pulsating key.

RULES FOR USING THE ARDOIS SYSTEM

1165. In signaling by the Ardois system the Cornet, WWWW, is a general call to attention. A station desiring to exchange signals will display the call letters of the station wanted, which will be answered by a similar display from the station called, or from each station successively called.

1166. If the call letters of a station be unknown, display the Cornet.

1167. The calls having been answered, proceed with the message, or if a special or preconcerted code is to be used, so indicate, and when answered proceed with the message.

1168. If it becomes necessary to put a signal message into cipher, the marking of the Ardois keyboard is on no account to be changed to accomplish this object.

HAND FLAGS

1169. Hand flags are authorized for general use by the army, though on account of their small range they are of limited application, and are chiefly serviceable for use within organizations, within fixed positions, or for incidental signaling. The range with flags of the usual size is of course dependent upon light and background, but is seldom more than one mile with the naked eye. This system of signaling has been highly developed in the navy, and on account of its rapidity and simplicity is of use to the army and

should be familiar to all soldiers. It is limited to visual signaling work and not adapted to general signaling as is the General Service Code. It will be found useful under many circumstances and is adapted to special work when rapid communication for short distances is needed. This method is also used to advantage for interior signaling within batteries of the field artillery and regiments of infantry, and will, at times, be convenient for the cavalry.

1170. The semaphore hand flags for service use, except those now temporarily issued to the field and the coast artillery, are 18 inches square divided diagonally into two parts, one of red and the other white; the staffs are 24 inches long. (See plates, pp. 497, 498.)

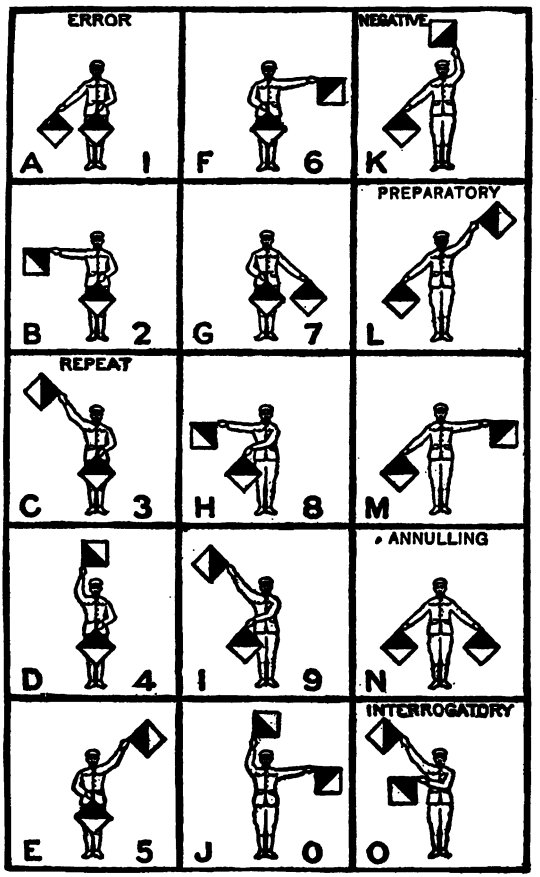
For the field and the coast artillery there is now issued a semaphore hand flag of orange with a scarlet center and scarlet with an orange center, one of each constituting a kit. The flags are 18 inches square, the centers 9 inches square, and the staffs 24 inches long.

The hand flags of the navy are from 12 to 15 inches square, of blue with a white square, or red and yellow diagonally, the colors to be used depending upon the background. The flags are usually attached to a light wooden staff about 2 feet in length.

1171. Hand flags are used in the same manner as the semaphore machine, except that in making the interval the flags are crossed downward in front of the body (just above the knees); the double interval is the "chop-chop" signal made twice.

The triple interval is "chop-chop" signal made three times. In calling a station face it squarely and make its call. If there is no immediate reply wave the flags over the head to attract attention, making the call at frequent intervals.

When the sender makes "end of message" the receiver, if message is understood, extends the flags horizontally and waves them until the sender does



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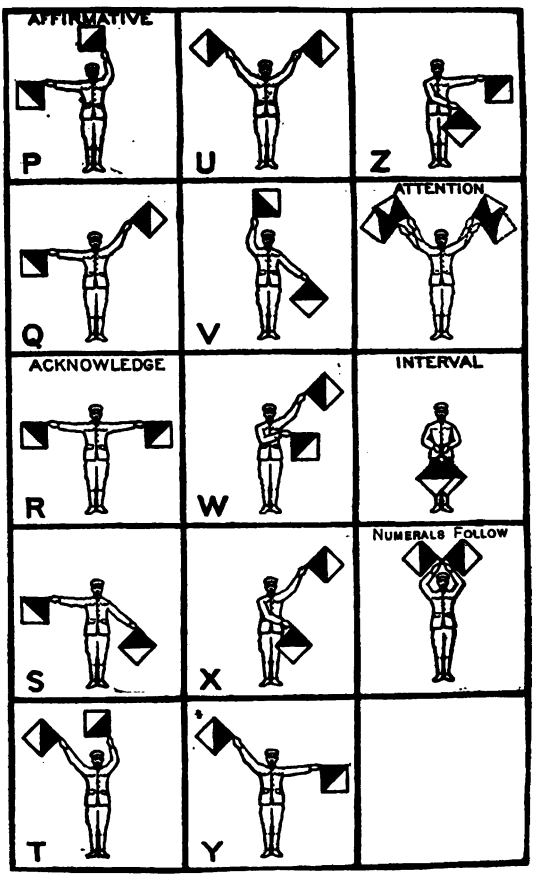
the same, when both leave their stations. Care must be taken with hand flags to hold the staffs so as to form a prolongation of the arms.



Signal Corps and Signaling

Letter Codes—Infantry

1172. For use with General Service Code or semaphore hand flags.

Letter of alphabet.	If signaled from the rear to the firing line.	If signaled from the firing line to the rear.
AM.	Ammunition going forward.	Ammunition required.
CCC.	Charge (mandatory at all times).	Am about to charge if no instructions to the contrary.
CF.	Cease firing.	Cease firing.
DT.	Double time or "rush."	Double time or "rush."
F.	Commence firing.	
FB.	Fix bayonets.	
FL.	Artillery fire is causing us losses.	
G.	Move forward.	Preparing to move forward.
HHH	Halt.	
K.	Negative.	Negative.
LT.	Left.	Left.
O.	What is the (R. N., etc.)? Interrogatory.	What is the (R. N., etc.)? Interrogatory.
(Ardois and semaphore only.)		
. . — — . .	What is the R. N., etc.)? Interrogatory.	What is the (R. N., etc.)? Interrogatory.
(All methods but ardois and semaphore.)		
P.	Affirmative.	Affirmative.
RN.	Range.	Range.
RT.	Right.	Right
SSS.	Support going forward.	Support needed.
SUF.	Suspend firing.	Suspend firing.
T.	Target.	Target.

Cavalry

1173. For use with General Service Code or semaphore hand flags.

AM—Ammunition going forward (if signaled from the rear to the front).
Ammunition required (if signaled from the front).

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CCC—Charge (if signaled from the rear to the front).
About to charge if no instructions to the contrary (if signaled from the front).
CF—Cease firing.
DT—Double time, rush, or hurry.
F—Commence firing.
FL—Artillery fire is causing us losses.
G—Move forward (if signaled from rear to front).
Preparing to move forward (if signaled from the front).
HHH—Halt.
K—Negative.
LT—Left.
M—Bring up horses (if signaled from front to rear).
Horses going forward (if signaled from rear to front).
O—What is the (R. N., etc.)? Interrogatory. (Ardois and semaphore only.)
..——..—What is the (R. N., etc.)? Interrogatory. (All methods but ardois and semaphore.)
P—Affirmative.
R—Acknowledgment.
RN—Range.
RT—Right.
SSS—Support going forward (if signaled from the rear to the front).
Support needed (if signaled from the front).
SUF—Suspend firing.
T—Target.

FIELD ARTILLERY

1174. For use with General Service Code or semaphore hand flags.

. . . . . —Error. (All methods but ardois and semaphore.)
A—Error. (Ardois and semaphore only.)
AD—Additional.
AKT—Draw ammunition from combat train.
AL—Draw ammunition from limbers.
AM—Ammunition going forward.
AMC—At my command.
AP—Aiming point.
B (numerals)—Battery (so many) rounds.
BS (numerals)—(Such.) Battalion station.
BL—Battery from the left.
BR—Battery from the right.
CCC—Charge (mandatory at all times). Am about to charge if not instructed to contrary.
CF—Cease firing.
CS—Close station.
CT—Change target.
D—Down.
DF—Deflection.
DT—Double time. Rush. Hurry.
F—Commence firing.

FCL (numerals)—On 1st piece close by (so much).
FL—Artillery fire is causing us losses.
FOP (numerals)—On 1st piece open by (so much).
G—Move forward. Preparing to move forward.
HHH—Halt. Action suspended.
IX—Execute. Go ahead. Transmit.
JI—Report firing data.
K—Negative. No.
KR—Corrector.
L—Preparatory. Attention.
LCL (numerals)—On 4th piece close by (so much).
LOP (numerals)—On 4th piece open by (so much).
LT—Left.
LL—Left from the left.
LR—Left from the right.
LE (numerals)—Less (so much).
MD—Move down.
ML—Move to your left.
MR—Move to your right.
MU—Move up.
MO (numerals)—Move (so much).
N—Annul, cancel.
O—What is the (R. N., etc.)? Interrogatory. (Ardois and semaphore only.)
..__ __.. —What is the (R. N., etc.)? Interrogatory. (All methods but ardois and semaphore.)
P—Affirmative. Yes.
PS—Percussion. Shrapnel.
QRQ—Send faster.
QRS—Send slower.
QRT—Cease sending.
R—Acknowledgment. Received.
RS—Regimental station.
RL—Right from the left.
RR—Right from the right.
RN—Range.
RT—Right.
S—Subtract.
SCL (numerals)—On 2d piece close by (so much).
SOP (numerals)—On 2d piece open by (so much).
SH—Shell.
SI—Site.
SSS—Support needed.
T—Target.
TCL (numerals)—On 3d piece close by (so much).
TOP (numerals)—On 3d piece open by (so muhc).
U—Up.
Y (Letter)—Such battery station.

COAST ARTILLERY

1175. For shore-tug signaling.

1. Range correct, ready to fire	K
2. Commence towing	C
3. Go out	O
4. Come in	I

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5. Distress	D
6. Hold stationary	S
7. Turn	T
8. Incline to port	L
9. Incline to starboard	R
10. Close practice	Z

General Instructions for Locating and Operating Visual Signal Stations

1176. To select a visual signal station, choose a point perfectly in view of the communicating station; fix the exact position in which the flagman is to stand, so arranged, if possible, that when viewed from the communicating station he will have behind him a background of the same color for every position in which the signals may be shown.

1177. Secrecy in communication is vitally important. Even though the code used is unknown to the enemy, yet the waving flag or other means of visual signaling will inform the enemy that he has probably been observed. This should be avoided, and stations located where they will be most difficult of discovery. If there is reason to believe that signals are seen by the enemy, they should be made in cipher and only upon the expressed authorization of the signal officer charged with the duties of maintenance. Extraordinary care should be taken in transmitting cipher messages, and, where practicable, they should be repeated.

1178. The color of the flag must contrast as strongly as possible with that of the background. With green or dark, or with earth-covered background, the white flag should be used. The distant station is the best judge of background, and should it indicate the color of flag wanted, that flag should be used.

1179. The following table shows the extent of horizon for different heights above the sea level;

that is, it shows how far an object at the sea level can be seen.

Height of the eye above sea level (in feet).	Distance (in statute miles).	Height of the eye above sea level (in feet).	Distance (in statute miles).
10	4	115	14
15	5	130	15
20	6	150	16
30	7	200	18
40	8	230	20
50	9	300	23
60	10	350	25
70	11	500	30
85	12	700	35
100	13	900	40

1180. Hence, an observer whose eye is 30 feet above the sea can distinguish an object 7 miles distant, providing it is at the sea level; but if the object is itself 15 feet above the sea he can make it out 7+5=12 miles off.

1181. The magnetic bearing of all stations with which another station has to work should be carefully noted and recorded in the office directly concerned.

In addition, guide lines may be established by driving two stakes firmly into the ground and close to each other. A prolongation of a line through the center of one stake and marked on the adjacent one will strike the distant station. Under each line should be written the name of the station which it marks.

1182. A signal officer should provide himself and the persons working under him with the latest and most accurate topographic maps of the country in which the army is operating. He should familiarize himself with and instruct his subordinates as to the location of each signal station, so that information can be promptly transmitted. He should have a list of the "calls" of each office and the personal signal of each man under his jurisdiction.

1183. Whenever one's station call is observed, the called station should at once respond, making at the close of the response the particular signal by which it is identified.

1184. The calling station should at intervals when calling give its own call or signal.

1185. When a station has sent all messages on hand, the signal "Cease signaling" should invariably be made. When nothing more is to be sent from either station, both will make "Cease signaling."

1186. If a signal station asks another to move its station either to its right or left, so that its signal will be more distinct, each station will see that a signalman holds a flag or lighted torch above his head. The station asking for the change will lower its flag immediately upon the distant station arriving at a position with a good background.

The Field Message

1187. The term "field message" is applied to all messages sent over field lines of information. All field messages for transmission over field lines of information by electrical or visual means should be plainly written by the sender on the blank forms in the Field Message Book. The practice of verbally delivering telegrams to enlisted men for transmission should invariably be discouraged.

1188. In framing telegrams, all words not important to the sense will be omitted. The last name of the officer addressed, or his title, and the last name of the sender, are generally sufficient (A. R., par 1188).

Proper names in any part of the message should be written or printed in ROMAN CAPITALS, thus: SMITH, TOLEDO, NAUMEE ROAD.

1189. The Field Message Book issued by the Signal Corps contains 50 message blanks with duplicate tissue sheets and two sheets of carbon paper.

Proper instructions for their use are printed on the cover of the Field Message Book.

Infantry Company Signal Flags

1190. The following is from the Infantry Drill Regulations, United States Army, 1911:

1191. The signal flags described are carried by the company musicians in the field. In a regiment in which it is impracticable to make the permanent battalion division alphabetically, the flags of a battalion are as shown; flags are assigned to the companies alphabetically, within their respective battalions, in the order given.

First battalion:
Company A. Red field, white square.
Company B. Red field, blue square.
Company C. Red field, white diagonals.
Company D. Red field, blue diagonals.

Second battalion:
Company E. White field, red square.
Company F. White field, blue square.
Company G. White field, red diagonals.
Company H. White field, blue diagonals.

Third battalion:
Company I. Blue field, red square.
Company K. Blue field, white square.
Company L. Blue field, red diagonals.
Company M. Blue field, white diagonals.

1192. In addition to their use in visual signaling, these flags serve to mark the assembly point of the company when disorganized by combat, and to mark the location of the company in bivouac and elsewhere, when such use is desirable.

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1193. For communication between the firing line and the reserve or commander in rear, the signals shown in paragraphs 41, 42, and 43, Infantry Drill Regulations, 1911, are prescribed. In transmission, their concealment from the enemy's view should be insured. In the absence of signal flags the headdress or other substitute may be used.

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Appendix

Manual of the Color

766. The word "color" implies the national color; it includes the regimental color when both are present.

The rules prescribing the colors to be carried by regiments and battalions on all occasions are contained in Army Regulations.

767. In garrison the colors, when not in use, are kept in the office or quarters of the colonel, and are escorted thereto and therefrom by the color guard. In camp the colors, when not in use, are in front of the colonel's tent. From reveille to retreat, when the weather permits, they are displayed uncased; from retreat to reveille and during inclement weather they are cased.

Colors are said to be cased when furled and protected by the oil-cloth covering.

768. The regimental color salutes in the ceremony of escort of the color, and when saluting an officer entitled to the honor, but in no other case.

If marching, the salute is executed when at 6 paces from the officer entitled to the salute; the carry is resumed when 6 paces beyond him.

The national color renders no salute.

The color guard

769. The color guard consists of two color sergeants, who are the color bearers, and two experienced privates selected by the colonel. The senior color sergeant carries the national color;

the junior color sergeant carries the regimental color. The regimental color when carried, is always on the left of the national color, in whatever direction they may face.

770. The color guard is formed and marched in one rank, the color bearers in the center. It is marched in the same manner and by the same commands as a squad, substituting, when necessary, **guard** for **squad.**

771. The color company is the center or right center company of the center or right center battalion. The color guard remains with that company unless otherwise directed.

772. In line the color guard is in the interval between the inner guides of the right and left center companies.

In line of columns or in close line, the color guard is midway between the right and left center companies and on line with the captains.

In column of companies or platoons the color guard is midway between the color company and the company in rear of the color company and equidistant from the flanks of the column.

In close column the color guard is on the flank of the color company.

In column of squads the color guard is in the column between the color company and the company originally on its left.

When the regiment is formed in line of masses for ceremonies, the color forms on the left of the leading company of the center (right center) battalion. It rejoins the color company when the regiment changes from line of masses.

773. The color guard when with a battalion that takes the battle formation, joins the regimental reserve, whose commander directs the color guard to join a certain company of the reserve.

774. The color guard executes neither loadings nor firings; in rendering honors, it executes all movements in the manual; in drill, all movements unless specially excused.

TO RECEIVE THE COLOR

775. The color guard, by command of the senior color sergeant, presents arms on receiving and parting with the color. After parting with the color, the color guard is brought to order arms by command of the senior member who is placed as the right man of the guard.

776. At drills and ceremonies, excepting **escort of the color,** the color, if present, is received by the color company after its formation.

The formation of the color company completed, the captain faces to the front; the color guard, conducted by the senior sergeant, approaches from the front and halts at a distance of 10 paces from the captain, who then faces about, brings the company to the present, faces to the front, salutes, again faces about and brings the company to the order. The color guard comes to the present and order at the command of the captain, and is then marched by the color sergeant directly to its post on the left of the color company.

777. When the battalion is dismissed the color guard escorts the color to the office or quarters of the colonel.

MANUAL OF THE COLOR

778. At the **carry** the heel of the pike rests in the socket of the sling; the right hand grasps the pike at the height of the shoulder.

At the **order** the heel of the pike rests on the ground near the right toe, the right hand holding the pike in a vertical position.

At **parade rest** the heel of the pike is on the ground, as at the **order**; the pike is held with both

hands in front of the center of the body, left hand uppermost.

The **order** is resumed at the command **attention.**

The left hand assists the right when necessary.

The **carry** is the habitual position when the troops are at a shoulder, port, or trail.

The **order** and **parade rest** are executed with the troops.

The color salute: Being at a carry, slip the right hand up the pike to the height of the eye then lower the pike by straightening the arm to the front.

(Paragraphs are those of the Infantry Drill Regulations, 1911.)

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